PB86-106630

Draft Environmental Impact Statement for Metropolitan Seattle. Volume 2
Carkeek Park, King County, Washington

(U.S.) Environmental Protection Agency
Seattle, WA

Sep 77

U.S. Department of Commerce
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See also PB86-106648. Prepared in cooperation with Municipality of Metropolitan Seattle, WA., Washington State Dept. of Ecology, Olympia, and Montgomery (James M.), Inc., Pasadena, CA.

The Draft Environmental Impact Statement is summarized in terms of the proposal, the alternatives considered, the direct and indirect impacts on the environment, and mitigating measures to eliminate adverse impacts. The Draft Facility Plan for Metropolitan Seattle Wastewater Facilities, prepared for the Municipality of Metropolitan Seattle, presents alternatives for Puget Sound Plants to the year 2005.

KEYWORDS: *Sewage treatment, *Environmental impact statements - draft.

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT
SEPTEMBER 1977

METROPOLITAN SEATTLE

CARKEEK PARK
VOLUME II
KING COUNTY, WASHINGTON

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REGION X, SEATTLE, WASHINGTON

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR
METROPOLITAN SEATTLE

Volume II

Carkeek Park

Number: EPA 910/9-77-043D
King County, Washington

Prepared jointly by:
Environmental Protection Agency,
Region X
Seattle, Washington 98101

Municipality of Metropolitan Seattle
Seattle, Washington

Washington State Department of Ecology
Olympia, Washington

With the Assistance of

James M. Montgomery, Consulting Engineers, Inc.
Pasadena, California/Boise, Idaho

Approved by:

Donald P. Dubois
Regional Administrator

August 25, 1977
Date

INTRODUCTION

A. Action Sponsor

The action sponsor is the Municipality of Metropolitan Seattle (METRO) for purposes of compliance with the State Environmental Policy Act (SEPA Chapter 43.21C RCW) and the Federal Environmental Protection Agency for the purposes of compliance with the National Environmental Policy Act (NEPA).

B. Lead Agency, Responsible Official and Contact Person

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C. Authors and Contributors to Draft Environmental Impact Statement

Introduction

Participating Agencies:	Environmental Protection Agency Department of Ecology Municipality of Metropolitan Seattle
Advisory Agencies:	City of Seattle King County Puget Sound Council of Governments
Consultants:	James M. Montgomery, Consulting Engineers, Inc. (Environmental Impact Statement) Metropolitan Engineers (Facility Plan) Human Resources Planning Institute (Socio-economic studies)

D. Licenses and Permits Required to Implement Wastewater Facilities Plan

Building, grading, complex source permit, shoreline permit and other local governmental permits would be required before implementing most of the alternatives described herein. Eligibility for grant funding by EPA and DOE would be determined after completion of the Final Facility Plan and EIS.

E. Location of EIS Background Data

Municipality of Metropolitan Seattle
Environmental Planning Division
SEPA Information Center
Room 404
600 First Avenue
Seattle, Washington 98104

F. Cost to Public for a Copy of the EIS

No charge while supply lasts.

G. Date of Issue of Draft EIS

This Draft Environmental Impact Statement was made available to the Council on Environmental Quality (CEQ) and the Public on September 23, 1977.

H. Final Due Date for Public and Agency Comments

The final date for submittal of public and agency comments is November 11, 1977. All comments should be sent to Mr. Roger K. Mochnick, Environmental Evaluation Branch, Environmental Protection Agency, 1200 Sixth Avenue, Seattle, WA 98101.

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Metro Council Members
City of Seattle Agencies:
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    Environmental Review Committee
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    Department of Engineering
    Department of Public Works
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This Draft Environmental Impact Statement was made available to the Council on Environmental Quality (CEQ) and the public on September 23, 1977.

SUMMARY OF DRAFT EIS CONTENTS

Environmental impact statement

The Draft EIS is summarized in terms of the proposal, the alternatives considered, the direct and indirect impacts on the environment, and mitigating measures to eliminate adverse impacts.

THE PROPOSAL

The Draft Facility Plan for Metropolitan Seattle Wastewater Facilities, prepared for the Municipality of Metropolitan Seattle, presents alternatives for Puget Sound Plants to the year 2005. Alternatives in the Draft Facilities Plans are focused on facilities at West Point, Alki, Carkeek Park, and Richmond Beach, but other sites within these designated service areas have been considered as options. The Metro plant at Renton is not included in the proposed facilities, but effects of alternatives on Renton are described since Renton is an integral part of the Metro system.

The Draft EIS, Volume I (Regional Analysis), analyzes the impacts of the eight regional alternatives proposed in the Draft Facilities Plan. Each alternative is evaluated on a co-equal basis in the Draft; no recommended alternative has been selected.

Regional alternatives were developed to address, in various combinations, four polar issues: water quality, site impacts, the law (PL 92-500) and costs. Components considered in developing alternatives included service area, collection system and transfer interceptors, treatment process, plant site, treated wastewater discharge location, combined sewer control, and sludge management. Interceptors to serve new growth were not included.

Two of the regional alternatives (A and B) are "no action" alternatives required by SEPA and NEPA. Two alternatives (C and D) address combined sewer overflow control, a local water quality problem. Four alternatives (E, F, G and H) provide secondary treatment in compliance with PL 92-500.

From the eight regional alternatives, it would be possible to select components to blend them into a new hybrid alternative.

The following sections describe the eight regional alternatives, particularly as they would affect Carkeek Park. Next, the impacts at Carkeek Park and in the service area are presented.

Summary of Draft EIS Contents

REGIONAL ALTERNATIVES

Alternative A - No Action

No capital expenditure would be made for expansion, modification or upgrading of treatment plants and no construction of new interceptors during the planning period (until 2005). Alternative A is evaluated to meet SEPA "no action" requirements.

Under Alternative A, Carkeek Park would continue to provide primary treatment, with a capacity in 2005 of 3.5 mgd average, 20 mgd peak. No capital improvements would be made at the plant, and CSO's would continue in their present pattern.

Alternative B - Metro Comprehensive Plan (No Action Pursuant to PL 92-500)

Plant upgrading and transfer interceptor construction would be done according to the Metro Comprehensive Plan. Alternative B is evaluated as the "no action" alternative pursuant to PL 92-500 and NEPA requirements and serves as the baseline for other alternatives. Puget Sound plants (West Point, Alki, Carkeek Park and Richmond Beach) would be retained with primary treatment. Improved sludge management and disinfection practices would be provided in Alternative B and all following alternatives. Four new transfer interceptors and improvements to the Alki outfall would be included.

At Carkeek Park primary treatment for 3.5 mgd average, 20 mgd peak flow would continue. The only capital improvement would be a chlorine leak detector.

Alternative C - Major Combined Sewer Overflow Control

Major portions of combined sewer overflows would be controlled by transfer from fresh to salt water and/or treatment. The existing Puget Sound plants would be upgraded to provide enhanced primary treatment by physical/chemical treatment of solids during the summer. A new wet weather enhanced primary treatment plant would be constructed in the lower Duwamish industrial area and the Alki plant would be abandoned, both in 1995.

Carkeek Park would be upgraded to enhanced primary treatment by addition of chemicals in 1985, which would require construction of chemical storage and feeding equipment. A new digester and dewatering facilities would be built for sludge handling. All new equipment would fit on the existing plant property.

Alternative D - Partial Combined Sewer Overflow Control

Wet weather combined sewer overflows would be reduced to Lake Washington, Lake Union and the West Seattle shorelines. The four Puget Sound plants would be upgraded to enhanced primary treatment with chemical addition during the summer for improved solids removal.

Alternative D would involve enhanced primary treatment at Carkeek Park, corresponding to Alternative C.

Alternative E - Secondary

Secondary treatment would be added to the West Point, Alki and Richmond Beach wastewater treatment plants. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flows would be pumped to West Point.

With the completion of the Carkeek to West Point interceptor in 1985, the Carkeek Park plant would treat only wet weather flows by primary treatment. After the Seattle sewer rehabilitation program is completed, the Carkeek Park Plant could be phased out, probably by 1995.

Alternative F - Secondary/Southern Strategy

Secondary treatment would be provided at Richmond Beach and West Point (with a reduced service area). A major new secondary treatment facility would be constructed in the Duwamish industrial area in 1985; the Alki plant would be abandoned at that time. A new outfall off Alki Point would be built for discharging effluent from the Duwamish (and Renton) plants. The Carkeek Park plant would provide primary treatment for wet weather flow only beginning in 1985; dry weather flows would be pumped to West Point.

With the completion of the Carkeek to West Point interceptor in 1985, the Carkeek Park plant would treat only wet weather flows by primary treatment. After the Seattle sewer rehabilitation program is completed, the Carkeek Park plant could be phased out, probably by 1995. At Carkeek Park this alternative would be identical to Alternative E.

Alternative G - Secondary/West Point Phaseout Option

Secondary treatment would be provided at the Alki and Richmond Beach plants. West Point would continue as a primary treatment plant for wet weather flows only, beginning in 1985. A new secondary treatment plant in the Interbay area (Commodore Way or Golf Park sites) would be constructed. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flow would be pumped to West Point.

With the completion of the Carkeek to Interbay interceptor in 1985, the Carkeek Park plant would treat only wet weather flows by primary treatment. After the Seattle sewer rehabilitation program is completed, the Carkeek Park plant could be phased out, probably by 1995. Alternative G would be similar to Alternative E at Carkeek Park.

Alternative H - Deconsolidation/Reclamation

Secondary treatment would be provided at West Point, Alki, Carkeek Park and Richmond Beach. Areas of growth would be served by new inland plants with local effluent and sludge reuse possible. Advanced waste treatment would be provided at new North and South Lake Sammamish plants. A new secondary plant at Kenmore would discharge treated effluent to Puget Sound.

The Carkeek Park secondary treatment plant would begin operation in 1985. Site expansion would be required for secondary aeration basins, clarifiers and new sludge treatment facilities.

ENVIRONMENTAL IMPACTS

The primary (direct) and secondary (indirect) impacts of each alternative are described by categories in the physical, With the completion of the Carkeek to West Point interceptor in 1985, the Carkeek Park plant would treat only wet weather flows by primary treatment. After the Seattle sewer rehabilitation program is completed, the Carkeek Park plant could be phased out, probably by 1995. At Carkeek Park this alternative would be identical to Alternative E.

Alternative G - Secondary/West Point Phaseout Option

Secondary treatment would be provided at the Alki and Richmond Beach plants. West Point would continue as a primary treatment plant for wet weather flows only, beginning in 1985. A new secondary treatment plant in the Interbay area (Commodore Way or Golf Park sites) would be constructed. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flow would be pumped to West Point.

With the completion of the Carkeek to Interbay interceptor in 1985, the Carkeek Park plant would treat only wet weather flows by primary treatment. After the Seattle sewer rehabilitation program is completed, the Carkeek Park plant could be phased out, probably by 1995. Alternative G would be similar to Alternative E at Carkeek Park.

Alternative H - Deconsolidation/Reclamation

Secondary treatment would be provided at West Point, Alki, Carkeek Park and Richmond Beach. Areas of growth would be served by new inland plants with local effluent and sludge reuse possible. Advanced waste treatment would be provided at new North and South Lake Sammamish plants. A new secondary plant at Kenmore would discharge treated effluent to Puget Sound.

The Carkeek Park secondary treatment plant would begin operation in 1985. Site expansion would be required for secondary aeration basins, clarifiers and new sludge treatment facilities.

ENVIRONMENTAL IMPACTS

The primary (direct) and secondary (indirect) impacts of each alternative are described by categories in the physical, biological and human environments plus natural resources and energy. A summary of the major effects of each alternative is described below for Carkeek Park.

Alternative A (No Action)

Alternative A, which would provide sewerage service to a small increase in sewered population by 2005 or would have comparable impacts as existing conditions. In Puget Sound, the discharge of solids, metals, toxicants and other materials would continue at present rates.

No additional changes over existing conditions in benthic communities or fish near the outfall would be anticipated. Localized effects from pumping station overflows would continue to have minor impacts on suspended solids and bacteria.

The continued chlorination practices at Carkeek Park which do not allow pacing applied chlorine dose to flow would result in continued over-and-under-chlorination. During the morning low flow, over-chlorination could create some residual toxicity. In contrast, under-chlorination in the winter peak flows would lead to inadequate disinfection and bacterial level along the beach exceeding shellfishing standards.

This alternative would not alter park use or impacts there relative to existing conditions. Occasional odors could be noticed by park users. Two sludge trucks per day would pass through the park.

Alternative A would not comply with the secondary treatment requirements of PL 92-500, but the implementation of this alternative is not realistic. It is evaluated merely to show the consequences of no action.

Alternative B - (Metro Comprehensive Plan No Action Pursuant to PL 92-500)

At Carkeek Park, the impacts of Alternative B would be analogous to Alternative A since the only difference at the site would be the addition of a chlorine leak detector for improved safety. Wastewater flow under Alternative B would be approximately 20 percent higher than in Alternative B for dry weather, but the annual discharge to Puget Sound and impacts thereon would not be appreciably different from Alternative A.

At the plant site, the plant impacts on odor, sludge truck traffic and parkland recreation would not be altered.

This alternative does not comply with PL 92-500 requirements for secondary treatment.

Alternative C - Major Combined Sewer Overflow Controls

Alternative C would result in non-degradation of water quality relative to existing (1975) conditions near Carkeek Park. Overall population and load increases of 20 percent would be balanced by improved treatment showing 20 percent reductions in suspended solids and BOD relative to the baseline Alternative B however, these loads would be nearly the same as existing loads. Therefore, no further changes in benthic communities or fish near the outfall are expected. Shellfish standards for bacteria in Puget Sound intertidal waters would probably continue to be exceeded, since the pumping station overflows would remain and the disinfection efficiency at the treatment plant would continue to be low in peak water flows.

Because no substantial changes would occur at Carkeek Park by upgrading to enhanced primary the site impacts would continue. Unless controlled, odor would remain a problem. Recreational use of the park in its present form could continue. Sludge truck trips would be less than one per day after installation of dewatering facilities.

Alternative C does not comply with the PL 92-500 requirements for secondary treatment as currently written. Consequences could include penalties and ineligibility for grant funding.

Alternative D - (Partial CSO Control)

At Carkeek Park, the impacts of Alternative D would be equivalent to Alternative C since enhanced primary treatment would be provided.

Alternative E - (Secondary)

The Carkeek Park plant would provide wet weather primary treatment only in 1985, with dry weather flow transferred to West Point for secondary treatment. Minor impacts on soils would result from the Carkeek to West Point interceptor; localized increases in turbidity and suspended solids would adversely affect the intertidal zone during construction. During the winter time, discharge of unchlorinated wet weather flows could intensify coliform levels along shellfishing beaches, but would eliminate any effects attributed to chlorine residual. In the summer, improved treatment could reduce coliform levels near the beaches, but this effect may be difficult to ascertain with continued Piper Creek discharges. Localized benefits to the intertidal zone near pumping stations would result from the elimination of combined sewer overflows.

If the plant is abandoned following the City of Seattle sewer improvement program within the Carkeek Park service area, water quality impacts on nutrients, bacteria, metals, solids, BOD and others from the plant discharge and pumping station overflows would cease.

The benthic communities near the outfall would begin to return to normal conditions and recovery in the intertidal near the pumping stations would occur. Near the Carkeek Park beach, the water quality may improve, but would still be subject to bacterial and sediment input from Piper Creek.

At the site, neither phase would substantially alter existing conditions in the park such as recreational use or occasional odors. Sludge truck traffic would be eliminated.

This alternative would comply with the secondary treatment requirement of PL 92-500. Timing requirements of the NPDES permit dated June 14, 1977 include completion of the Facility Plan and EIS by June 30, 1978 followed by development of a compliance schedule for design and construction to meet the required 1983 date for completion of best practicable treatment facilities.

Alternative F - Secondary/Southern Strategy

This alternative and its impacts in the Carkeek Park service area would be identical to Alternative E.

Alternative G - Secondary/West Point Phaseout Option

This alternative would be the same for Carkeek Park as Alternative E, except that the dry weather flows would be transferred to Interbay rather than West Point. For the Carkeek Park service area, plant and interceptor impacts would be as in Alternative E.

Summary of Draft EIS Contents

Alternative H - Deconsolidation/Reclamation

Of all alternatives for Carkeek Park, providing secondary treatment would produce the most substantial site impacts and beneficial water quality impacts. The loads of suspended solids and BOD to the Puget Sound outfall would decrease by 75 to 80 percent relative to Alernative B; associated metals, toxicants and microorganisms would also decline. However, no improvement in nutrient loading (specifically nitrogen) would result from secondary treatment. No major changes in disinfection relative to Alternative B are included in Alternative H, so underchlorination in peak flows and overchlorination in low flows would continue. Elimination of pumping station combined sewer overflows would benefit localized portions of the intertidal zones, allowing them to recover.

Constructing secondary treatment facilities would require design considerations to ensure structural integrity on presently unstable slopes. Excavation of existing fill would be necessary, as would rerouting Piper Creek, which would have an adverse impact on fish therein.

A picnic area near the plant would not be available due to the additional 1.1 acres needed for secondary treatment, so a minor adverse impact on recreation would result. Sludge truck traffic would be less than one trip per day.

Alternative H would meet secondary treatment requirements under PL 92-500. NPDES timing requirements include completion of the Facility Plan and EIS by June 30, 1978 followed by development of a compliance schedule for facility design and construction.

MITIGATION MEASURES

Possible mitigation measures to alleviate or eliminate adverse impacts at the Carkeek Park plant site and service area include the following:

1. Improving the chlorine feeding equipment to pace chemical application rate to flow and eliminate over-or-under-chlorination (Alternatives B - D).
2. Dismantling the existing plant and returning the site to a more park-like setting in the event the plant is eventually phased out or abandoned (Alternatives E, F and G).

3. Rerouting Piper Creek so that it does not pass in a channel below the plant to improve conditions for fish (Alternatives B - G).

4. Considering other inland interceptor routes from Carkeek to West Point (Alternatives E and F) or to Interbay (Alternative G) that would not result in siltation or other adverse impacts in the intertidal zone.

5. Covering secondary clarifiers for possible recreational uses (such as tennis) to replace present recreation at the picnic area (Alternative H).

6. Landscaping the Carkeek Park site, particularly to screen views from the picnic area or canyon trail (Alternatives B - H).

7. Dewatering sludge on-site at Carkeek Park to reduce sludge truck traffic (Alternative B).

8. Operating chemical addition and enhanced primary treatment at Carkeek Park all year to reduce loads of solids, metals, and other parameters to Puget Sound (Alternatives C and D).

9. Investigating further the cause of excess grease in the Carkeek Park influent since the grease plugs outfall diffusers and inhibits effective effluent dilution; source control measures could be instituted if the grease source(s) is identified (Alternatives B, C, D, H)

UNAVOIDABLE ADVERSE IMPACTS

The remaining impacts on water quality, biology, socioeconomics, sites, costs, energy and natural resources that could not be mitigated by the previously mentioned measures under each alternative would be unavoidable adverse impacts.

DESCRIPTION OF THE PROPOSAL

A. Name of the Proposal and Sponsors

This information is contained in the Introduction and in the Summary of Draft EIS Contents.

B. Location of the Project

The project location is described in Chapters 1 and 3 of the Draft EIS.

C. Other Agencies File Numbers on Proposal

The reader is requested to contact Mr. Roger Mochnick (EPA), Mr. John McDonnell (DOE), and Dr. Peter Machno (Metro) for this information.

D. Identification of Construction Phasing and Future EIS Requirements.

Chapter 3 contains this information.

E. Description of Physical and Engineering Aspects of the Project

These descriptions are summarized in Chapter 3 of the Draft EIS and are detailed in the Draft Facilities Plan.

F. Land Use Plans and Zoning Regulations

Chapter 2 of the Draft EIS described existing and projected land use; Chapter 3 addresses whether the proposal is consistent with these regulations.

PREFACE

This Draft Environmental Impact Statement (EIS) evaluates the impacts of alternative wastewater facilities described in the Draft Facility Plan developed for the Municipality of Metropolitan Seattle (Metro). The alternatives include wastewater treatment plants, transfer interceptor sewers, combined sewer overflow control facilities and sludge handling facilities that would be constructed and operated by Metro. The major part of construction costs could be provided by grants from the Environmental Protection Agency (EPA) and the Washington State Department of Ecology (DOE).

The EIS has been prepared in response to federal and state legislation plus local resolutions requiring that EPA, DOE and Metro each fully consider the environmental impacts and consequences of alternative projects prior to making a final decision to proceed on a recommended project. The respective responsibilities for the three agencies in the EIS process were established for EPA in the National Environmental Policy Act (NEPA), 42 U.S.C. Sec. 4321, *et seq.*; for DOE in the Washington State Environmental Policy Act (SEPA) Chapter 43.21C RCW; and for Metro in Metro Council Resolution No. 2582.

In certain cases, significant environmental impacts could result from the various wastewater facilities alternatives. For example, alternatives for Metro's West Point, Alki and Carkeek Park wastewater treatment plants may have significant environmental impacts; similarly an evaluation of facilities on a regional level indicated that some significant impacts should be considered. Therefore, a decision was made to prepare an EIS on these projects to comply with both NEPA and SEPA requirements. Rather than preparing separate EIS documents at the appropriate time, the three agencies agreed to prepare a joint EIS for the regional facilities alternatives, plus the West Point, Alki and Carkeek Park alternatives. In addition to satisfying both NEPA and SEPA with the joint EIS, the agencies also chose a procedure designed to eliminate delays and duplication of effort as well as to facilitate desirable interchange among the agencies and with the public during the early stages of the EIS process.

In another case facilities would not cause significant environmental impacts as defined in NEPA. Therefore, an EIS pusuant to SEPA (which would also serve as an environmental assessment) was prepared for the Richmond Beach site and service area.

Preface

For the total evaluation of the environmental impacts of alternative facilities plans, the environmental analysis has been organized as follows: Regional Analysis EIS (Volume I), West Point Treatment Plant EIS (Volume II), Alki Treatment Plant EIS (Volume II), Carkeek Park Treatment Plant EIS (Volume II), Richmond Beach Treatment Plant EIS (pursuant to SEPA) (Volume II). Each site-specific document (Volume II) is intended to be read with the regional analysis (Volume I), with each such pair constituting a complete EIS.

The production of this joint Draft EIS results from close cooperation between EPA, DOE, and Metro. All three agencies have been intimately involved with the review, analysis, supplementation, and synthesis of materials furnished by independent consultants hired to assist with the preparation of the EIS. The City of Seattle, King County, and the Puget Sound Council of Governments have also participated in meetings and provided comments on preliminary draft materials to ensure that local government concerns and regional land use planning goals were incorporated in the EIS.

EPA regulations on "Preparation of Environmental Impact Statements" (40 CFR Part 6; 40 FR, April 14, 1975), Council on Environmental Quality Guidelines for the "Preparation of 20550, August 1, 1973), and the EPA "Manual for Preparation Works, Facilities Plans, and 208 Area-wide Treatment Management Plans" (July 1974) have been used in preparation of the Council Resolution No. 2582, have been followed insofar as they are consistent with federal requirements.

Some of the alternatives described in the Draft EIS'S and Draft Facility Plans include the provision for secondary treatment at Metro facilities by 1985. The twenty year planning period is from 1985-2005. These 1985 dates are not consistent with the current PL 92-500 requirement for Best Practicable Treatment including secondary treatment by 1983. According to the facility planning engineers, the 1985 date may be more realistic than 1983 due to delays in the Step I planning process, and thus in the start dates for Step II (design) and Step III (construction).

However, since the law currently requires Best Practicable Treatment by 1983 the construction schedules will be changed to reflect this. Due to time constraints it was not possible to change the dates in the Draft Plans and EIS's. The reader should note that any mention of secondary treatment in 1985 will be changed to 1983 in the Final Plans and EIS's. The twenty year planning period also changes to 1983-2003.

These changes may impact the analysis of alternatives in several minor ways. First there is a potential for a slight saving in costs, due to the decrease in inflation associated with an earlier start date. However, the need for this earlier start date compresses the design and construction schedules causing an increase in these costs. The two factors, one a potential savings and one in increase in costs, will probably negate one another.

The new planning period from 1983-2003 will cause population projections and solids loading to decrease slightly. This decrease, estimated at 2 percent, is well within current sensitivity of the projections and should not have a noticeable impact on the analysis.

All comments on this Draft EIS should be sent to the EPA as the lead agency in the EIS process. Comments should be addressed to Mr. Roger Mochnick, Environmental Evaluation Branch, Environmental Protection Agency, 1200 Sixth Avenue, Seattle, Washington, 98101. The EPA will then distribute copies of the comments to DOE, Metro and the EIS consultant. Comments will be used by the three agencies in preparing the Final EIS and in their decision-making processes.

It is believed that this process best enables the agencies involved to fully assess and consider all significant physical, economic, and social effects of their proposal, and public input thereon, prior to any significant decision-making step. For this reason, the agencies have not attempted to bias the decision to be reached by recommending any one of the eight alternatives prior to full completion of the EIS process, including the public hearings. Rather, the attempt of this document is to present the decision makers and the public with as complete an analysis as possible of each of the alternatives so that a fully informed decision can be made.

The remaining part of the decision-making process will proceed under the following schedule:

October 25, 1977	Public hearing on Regional Draft EIS
November 1, 1977	Public hearing on Carkeek Park Draft EIS
November 1977	A preferred alternative is recommended by Metro in conjunction with EPA and DOE
February 1978	Final EIS is available
March 1978	Public hearings on Final EIS
April 1978	Metro Council decision

April 1978	DOE decision
April 1978	EPA decision

CHAPTER I

BACKGROUND

The Carkeek Park wastewater treatment plant is one of five Metro treatment plants that will be affected by the wastewater management alternatives being considered in the Draft Facility Plan. Figure 1-1 shows the treatment plants' locations and the service areas tributary to each.

This report, Volume II, presents the impacts of these alternatives on Carkeek Park and its environment. Three other site documents for West Point, Alki, and Richmond Beach are also included in the Volume II series. Impacts of the alternatives on the regional level and a background of the regional issues are discussed in Volume I, Regional Analysis.

The area served by the Carkeek Park plant includes approximately 4,350 acres adjacent to Puget Sound in the northwest corner of the City of Seattle, north of 85th Street. The tributary area is primarily residential, producing typical domestic sewage with no appreciable industrial load.

The Carkeek Park wastewater treatment plant is a primary treatment plant on 2.9 acres of land in the center of Carkeek Park, Figure 1-2. The treatment plant is designed for an average daily flow of 3.5 mgd. The collection system is subjected to high inflow and infiltration during storm periods and can be considered a combined sewer system. The design peak wet weather flow is 20 mgd.

Although the plant is located on Piper Creek, the treated effluent is discharged to Puget Sound via pipeline and submarine outfall. The 33-inch diameter outfall extends 2,100 feet offshore and terminates in a 50-foot diffuser section at an average discharge depth of 200 feet.

The solids removed in primary treatment are digested onsite and trucked in liquid form to the Interbay Pumping Station. From there, sludge is pumped to the West Point treatment plant.

The Carkeek Park plant was constructed during 1962-63 and

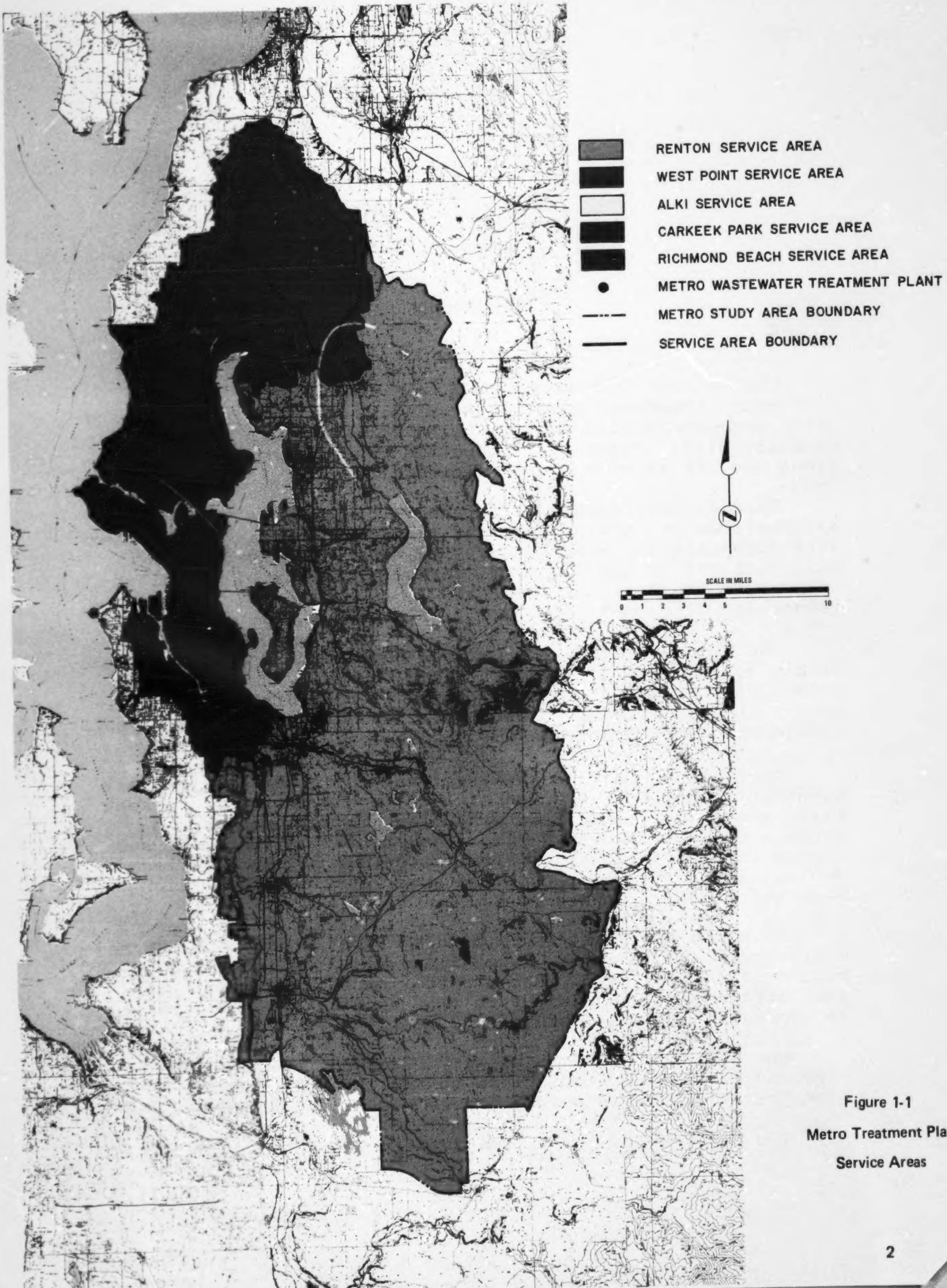
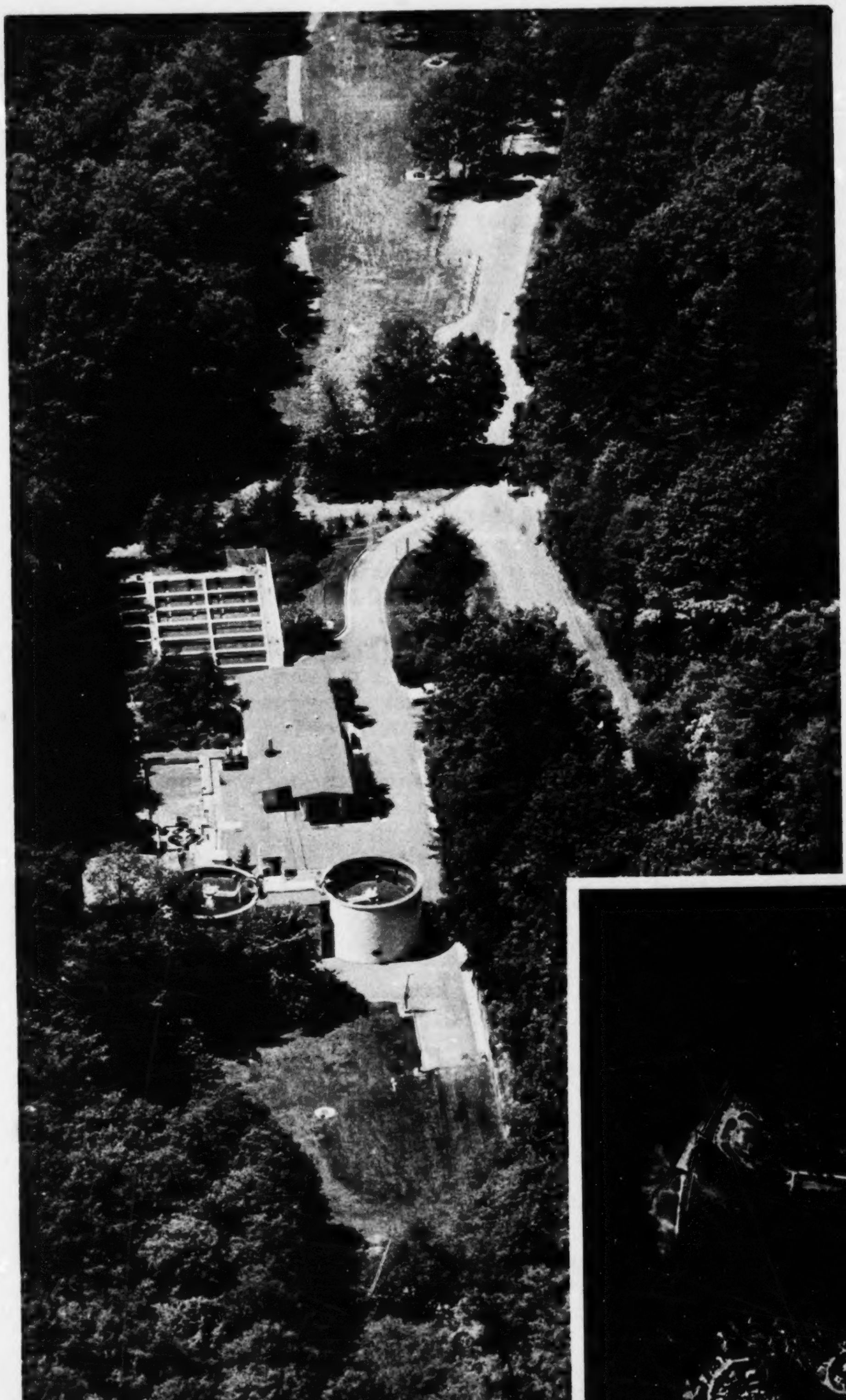

RENTON SERVICE AREA
WEST POINT SERVICE AREA
ALKI SERVICE AREA
CARKEEK PARK SERVICE AREA
RICHMOND BEACH SERVICE AREA
METRO WASTEWATER TREATMENT PLANT
METRO STUDY AREA BOUNDARY
SERVICE AREA BOUNDARY
N
SCALE IN MILES
0 1 2 3 4 5 10

Figure 1-1

Metro Treatment Plant

Service Areas



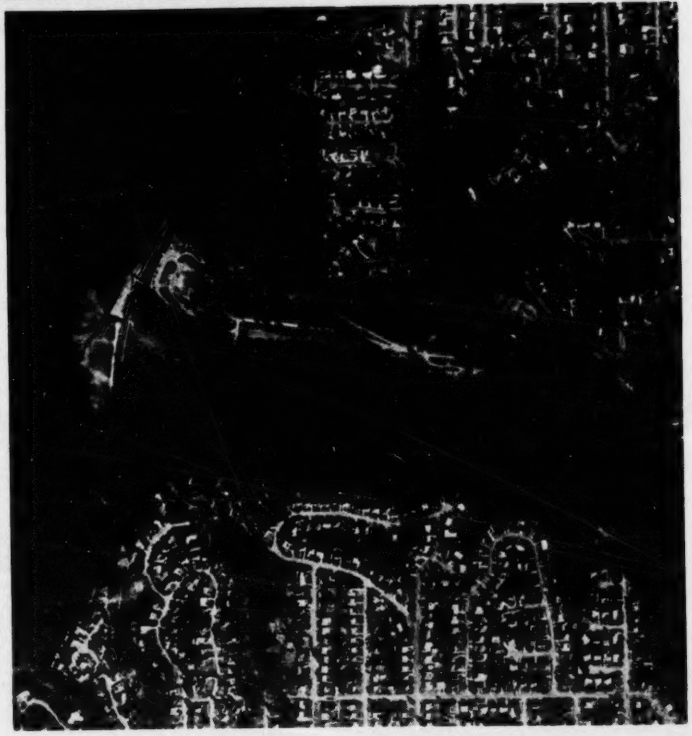
Background

Figure 1-2

Aerial Views of
Carkeek Park

Side:
View of Treatment plant looking in westerly direction. Picnic area at top of photograph.

Below:
The treatment plant is located slightly to right of center in this high altitude view. Northerly direction is from bottom of photograph to top.



began operating in 1963. The capital cost (1963 dollars) was $800,000.

At present three operating personnel are required to staff the facility, which has an operating cost of $143,000/yr. Traffic generated by plant operation amounts to six round trips per day for personnel and one round trip per day for sludge trucks. More detailed descriptions of the service area and treatment facility are included in Chapter III under the "No Action" alternative.

Site Constraints and Issues

Due to its location in a community park, the Carkeek Park plant has several site constraints and community issues that could affect its continued operation or expansion to meet secondary treatment requirements of PL 92-500.

Currently, there are several issues at the Carkeek Park plant that have affected selection of alternatives for the site. Access to the park and plant is along the narrow, winding N.W. Carkeek Park Road, which is at times subject to heavy traffic. Odors can be objectionable near the park entrance and along the main trail. Noise is not a problem because the plant operations do not currently generate much noise and there are no nearby residences. At the beach below the plant, water in Puget Sound contains bacteria exceeding standards for commercial shellfish; the source of these bacteria has not been determined yet, but may be due to the Carkeek wastewater discharge or Piper Creek.

Expanding the plant would require trade-offs at the site for improved water quality in Puget Sound. Engineering estimates (Metropolitan Engineers, 1977) indicate a secondary plant would occupy 4.0 acres rather than the current 2.9 acres. High banks south of the plant are subject to landslides, restricting expansion there. Other options considered in the Draft Facility Plan would involve removing a small wooded area, replacing a picnic area, or blocking access to a canyon trail. New structures could also have aesthetic impacts.

At a public meeting held on November 15, 1976 at Shoreline Community College, residents of the Carkeek Park area complained of odors in the park and emanating from certain manholes, and expressed concern over the possible loss of the picnic area and the potential for increased sludge truck traffic. They also questioned the stability of Carkeek hillsides and the legality of using park land for treatment purposes. Other residents voiced their displeasure over the present Metro pricing system which they believe subsidizes suburban connections at the expense of urban users.

At a June 8, 1977 public workshop on the eight regional alternatives and their implementation at Carkeek Park,citizens reiterated concerns for the visual impact of plant expansion and possible additional odors. As a group they would oppose the expansion required for secondary treatment at Carkeek Park due to a concern for its negative impacts on the park. If the plant were expanded, the group did not reach a consensus as to whether the picnic area or the trail and canyon area should be protected from future developments. The group favored alternatives that phase out the Carkeek Park plant, but noted that the impacts of expanding the North Beach pumping station or constructing a Duwamish plant should be reinvestigated in the EIS. Other issues included protecting Puget Sound water quality, and sizing the treatment relative to area growth. Group priorities were (1) not enlarging the Carkeek Park plant site, (2) improving Puget Sound water quality, and (3) maximizing energy or revenue production from wastewater treatment residuals.

CHAPTER II

ENVIRONMENTAL SETTING

Environmental characteristics for the Carkeek Park service area and treatment site as described in this section are largely supplements to material previously presented in Volume I, Regional Analysis.

PHYSICAL ENVIRONMENT

Characteristics reviewed include topography, geology, hydrographic features, water quality, climate, and air quality.

Topography

The Carkeek Park service area rises sharply from Puget Sound to elevations exceeding 400 feet. Most of the area lies between 200 and 400 feet. The most prominent topographic feature in the service area is the deeply incised ravine cut by Piper Creek. Within the service area, Piper Creek runs north from near Holman Road swinging west toward Puget Sound in the vicinity of 115th Street N.W.. Figure 2-1 illustrates general topography; topographic sections through the site are shown in the Facility Plan. Carkeek Park itself is defined in large part by the Piper Creek basin. Steep slopes running east and west parallel to the creek have constrained development within the basin. The basin slopes gradually to the west, broadening as it approaches the Sound.

Geology and Soils

Upland portions of the Carkeek Park service area consist primarily of Vashon till, a concrete-like mixture of clay, silt, sand, and gravel. Some outwash material is

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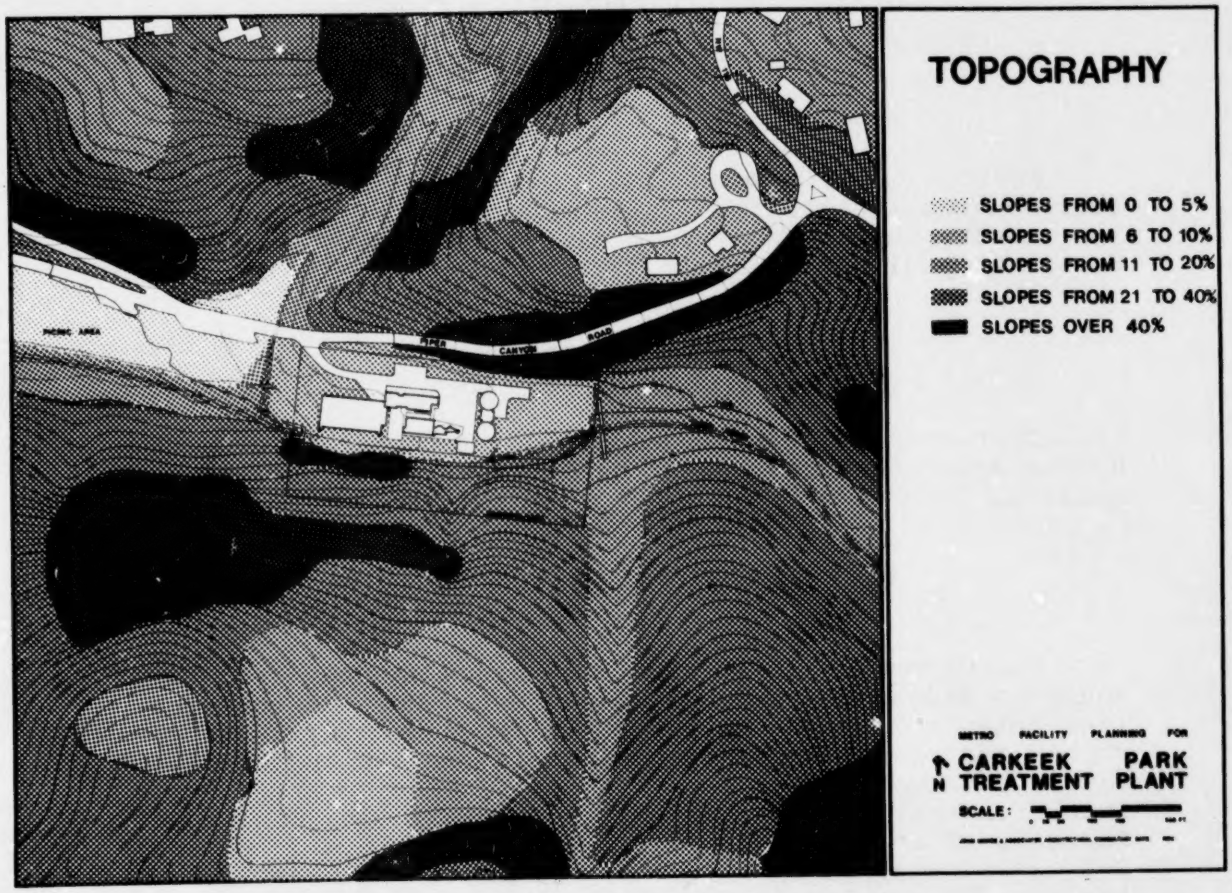

TOPOGRAPHY
SLOPES FROM 0 TO 5%
SLOPES FROM 6 TO 10%
SLOPES FROM 11 TO 20%
SLOPES FROM 21 TO 40%
SLOPES OVER 40%
PIPER CANYON ROAD
PICNIC AREA
METRO FACILITY PLANNING FOR
CARKEEK PARK TREATMENT PLANT
N
SCALE:

Figure 2-1

Topography — — Carkeek Park

also present in the uplands. The slopes immediately above the Sound consist of undifferentiated pre-Vashon deposits. These are made up of till, outwash, and associated interglacial deposits.

Locally, the bluffs above Puget Sound within the Carkeek Park service area experience severe erosion. Slides are common where sandy soils overlie deposits of relatively low permeability, causing oversaturation of the upper layer.

Soils in the Carkeek Park service area consist of till, outwash, and associated interglacial deposits of both sorted and unsorted gravel, sand, silt, and clay. There is considerable variation of physical and engineering properties due to the interbedding of materials of differing size. The soil contains water generally under high hydrostatic head, runoff potential is variable, infiltration slow, with springs and seeps being common.

Soil associations are of the Alderwood-Everett series, and are composed of silty and sandy soils with coarse fragments formed in glacial materials. Everett series covers terraced areas (alluvial plains), and is formed of glacial outwash consisting of gravelly, sandy loam,20 to 36 inches over gravel and sand. The subsoil permeability is rapid (5 to 10 inches per hour). Alderwood soils generally cover upland areas and are formed from glacial till, consisting of gravelly, sandy loam,20 to 40 inches over cemented till. Surface permeability is 5 to 10 inches per hour with substratum permeability being much slower (less than 0.05 inch per hour), which causes drainage to be slow in some areas. All soils in these two classifications are subject to moderate erosion.

A soils investigation for the existing plant indicated that the bed of Piper Creek was filled with material excavated during construction. In some locations it reaches a depth of seven feet. Below the fill, medium-dense to dense sands or sand and gravel predominate. These deposits underlie the site to the depth explored (17 feet MSL). Thin peat layers occur in this same zone. Groundwater ranged from 36 to 38 MSL. Clayey soils were found at and beyond the southern creek bank. The upland area is about 200 feet higher than the creek bed and the slope may be unstable.

Seismicity

Seismic hazard in the Carkeek Park service area is approximately the same as for other parts of the Puget Sound basin. Average recurrence rates for earthquakes of varying magnitudes are shown in the Regional Analysis, Volume I.

Climate

The average annual rainfall at the Carkeek Park treatment plant is 39 inches; much of the rainfall comes during winter.

Air Quality and Odors

Since the Carkeek Park service area is not considered an air quality problem area, air quality records in the immediate vicinity are virtually non-existent. Similarly, there is no data available for the treatment plant. The location of the plant is particularly unfavorable for dispersion of plant emissions. Air flow out of the valley can only occur to the west where the valley opens onto Puget Sound and air movement is unrestricted. This occurs under stable conditions as heavy cooler air moves down the valley and when this flow is not counteracted locally by onshore winds.

Onshore winds typically parallel the shoreline, flowing in a southerly direction from April to September. From October to March, prevailing winds increase in intensity and flow in a northerly direction. Under certain meteorological conditions, the high bluffs above the Sound and east of Carkeek Park act as barriers preventing circulation of air masses from the park area to the uplands. Subsidence inversions also prevent circulation of air within the service area and the Puget Sound basin as a whole. Inversions are frequent during autumn months and they may persist for days at a time.

Odors at the Carkeek Park plant are currently controlled by pre-and post-chlorination, by combustion of waste digester gas and by good plant practices. Generally, local topography and the heavily wooded surroundings combine to serve as an effective buffer zone between the plant and nearby residents. Faint odors associated with the treatment process can be detected in the vicinity of the plant, particularly on warm, windless days. Under certain conditions, hydrogen sulfide (H_2S) can be detected about sewer manholes in the canyon east of the plant. There have been few citizen complaints regarding odors from the plant.

Environmental Setting

Water Resources

The surface waters in the Carkeek Park service area and vicinity include Piper Creek and Puget Sound.

Piper Creek

This small creek originates in the vicinity of 110th Street N.W., traverses Carkeek Park and discharges to Puget Sound 1.35 miles downstream of its source. The creek passes under the southern portion of the Carkeek Park sewage treatment plant for 400 feet in a culvert to avoid occasional flooding or contamination from wastewater. At the creek's outlet to the Sound, the beach has been widened slightly by the creek's deposition of alluvial material. Monitoring of water quality by Metro staff indicates high bacterial counts in the creek. The source(s) of bacteria has not been identified.

Puget Sound

Puget Sound forms the west border of the Carkeek Park service area for six miles. Seaward of the shoreline, the bottom drops off rapidly until depths generally exceed 300 feet within half a mile of the shore.

The currents off Carkeek Park are less complex than that at West Point or Alki Point. Net water movements at the surface and at depth tend to parallel the shore. Tide-induced current reversals take place within an hour or so and slack water periods are relatively short. Maximum surface velocities averaging 70 feet per minute (fpm), were observed parallel to shore on a flood tide having a 12-foot range. At the same time, velocities of 35 fpm and 30 fpm were observed at 100 and 200 feet, respectively. However, there are indications of some eddy formations near Carkeek Park under certain tidal conditions (Duxbury, 1977).

Onshore currents develop during slack water periods when horizontal current shear and water accelerations and decelerations predominate. It is during these periods that horizontal mixing appears to be greatest. It is also during these periods that discharged effluent is most likely to reach shore. Onshore currents are in the 10 to 15 fpm range (Metropolitan Engineers, 1977).

Environmental Setting

The wastewater from the Carkeek Park facility is discharged 2100 feet offshore at a depth of 200 feet. Design dilution ratio is 100 to 1.

Surveys were conducted (Environmental Quality Analysts, 1974 and 1975) in August of 1974 and January of 1975 to determine if the effluent plume was discernible using standard water quality parameters - DO, pH, salinity, temperature, and light transmittance. The wastewater field was not evident from data collected during the August survey. The winter survey took place during a period of heavy precipitation. Because of the large amount of stormwater input to the sewerage system, the receiving water parameter most affected by the wastewater field was salinity.

The presence of the field was discernible by a salinity gradient lower than that measured at distances from the vicinity of the outfall. The presence of the field was detectable at a station one mile north of the discharge point. Similarly, the field was discernible on the basis of light transmittance. In the surface layer, the surface wastewater field was masked by the naturally turbid surface waters, but the gradient of light transmittance of the upper 15 feet at stations in the immediate vicinity of the discharge is less than the gradient at stations remote from the discharge. This weakening of the gradient is judged to be due to the admixture of wastewater effluent.

Grease in influent has been a problem, deterring efficient operation of the outfall. In 1975, an inspection revealed that four of the twelve ports were sealed with grease. Divers were unable to clear them. Sealed ports result in a decrease in initial dilution. The grease problem at the outfall is the result of grease-handling problems at the plant itself.

Overchlorination of treated wastewater probably occurs regularly in the morning hours (Metropolitan Engineers, 1977). While effective in destroying potentially harmful bacteria, the chlorinated hydrocarbons and chloramines produced by chlorination are highly toxic to marine life at very low levels. Chlorinated organic compounds formed by chlorine application to wastewater are also of concern as they do not degrade but are toxic and tend to accumulate in biota in receiving waters.

Hydraulic overloads occur in the Carkeek Park system even though 90% of the sewers are separated. Both plant bypass and wet weather bypass at the North Beach pump station can occur, resulting in discharge of diluted, untreated sewage to Puget Sound through the present outfall from plant bypass or through the old outfall or pump station bypass. During overloaded conditions, when bypass does not occur, the plant effluent quality is expected to degrade. Although there are no combined sewer overflows at Carkeek Park, the overloaded plant capacity from infiltration/inflow could affect local nearshore water quality for several days during and after storms.

Coliform bacteria, general indicators of water quality, have been sampled off Carkeek Park at nearshore and offshore stations. At the Piper Creek nearshore site (Station 211) beach samples over the past five years and in 1975 samples had a median coliform count exceeding the level of 70 total coliforms per 100 ml, which is the generally accepted criterion for safe bathing. The writers know of no beach closures at this site, however.

Fecal coliforms at the same site had median concentrations in excess of 14 per 100 ml, the standard for commercial shellfishing (Metro,1976). Shellfish are not now monitored, however. Intertidal hardshell clams may have been fished out, but oyster drills and geoducks remain. Although coliform standards have been routinely exceeded, the source is presently unknown, but under investigation by Metro and the City of Seattle. Possible sources of these bacteria are 1) discharge from Piper Creek, 2) plant bypass or pump station overload, and 3) effluent from the Carkeek Park outfall that reaches shore from certain current or tidal patterns.

Impacts of the outfall at present are difficult to discern due to the fact that most studies have focused their investigation on the West Point outfall and its potential impacts. Results from Interim Studies (Duxbury,1977) do indicate minor local influences on water quality in the vicinity of the Carkeek Park outfall. Metals and nutrients in effluent have not been clearly demonstrated to be water quality problems.

Groundwater in the Carkeek Park service area is not discussed further because it is not now used and is not expected to be adversely affected by any of the alternatives.

BIOLOGICAL ENVIRONMENT

Terrestrial Biology

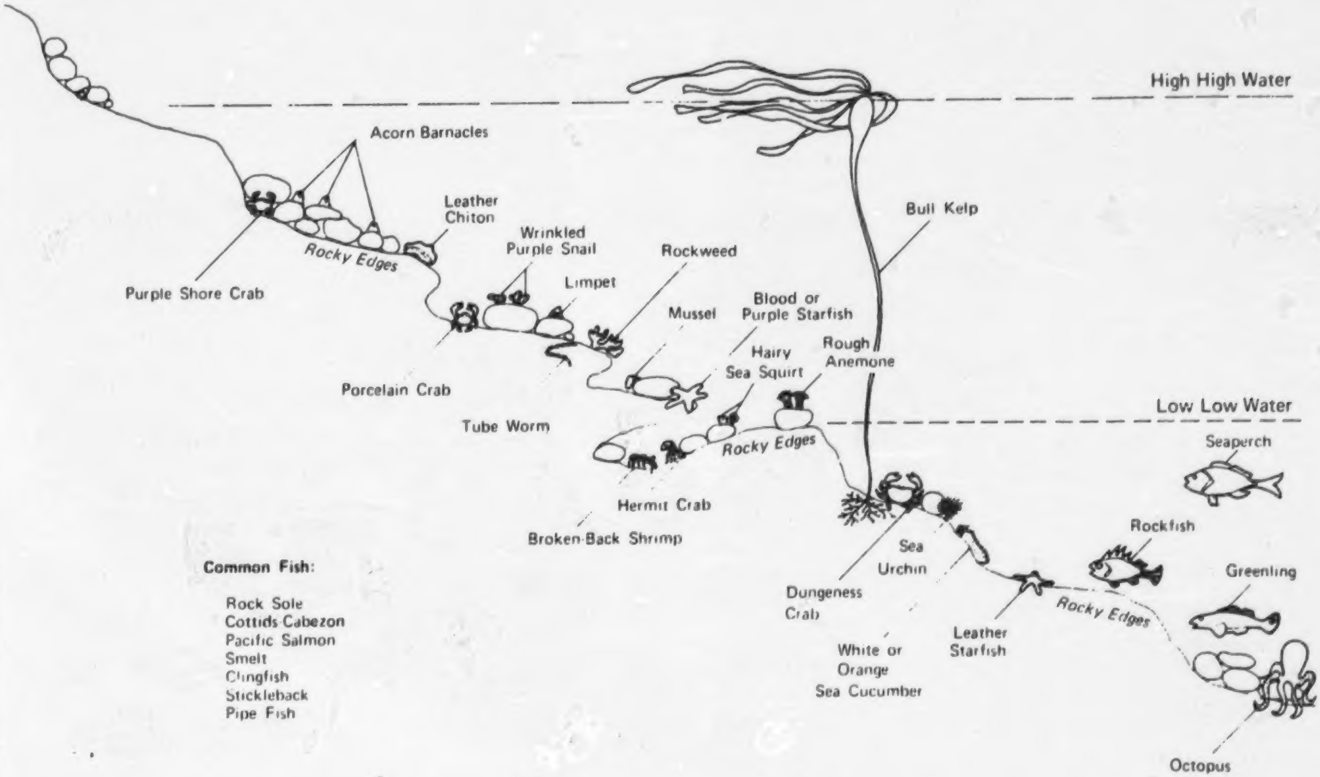
Carkeek Park consists of grassy meadows and ravines with alder, maple, fir and cedar trees. Young trees, shrubs, forbs, grasses, and mosses constitute the understory. Plant landscaping includes grassy areas, juniper, Douglas fir, and cedar. Thickets of Himalayan blackberry, salmonberry, and other shrubs provide food and shelter for California quail, rufous-sided towhees, sparrows, lizards, and toads. The park is large enough to support rabbits, raccoons, weasels, squirrels, and chipmunks, as well as a number of migratory and resident birds.

Puget Sound Ecology

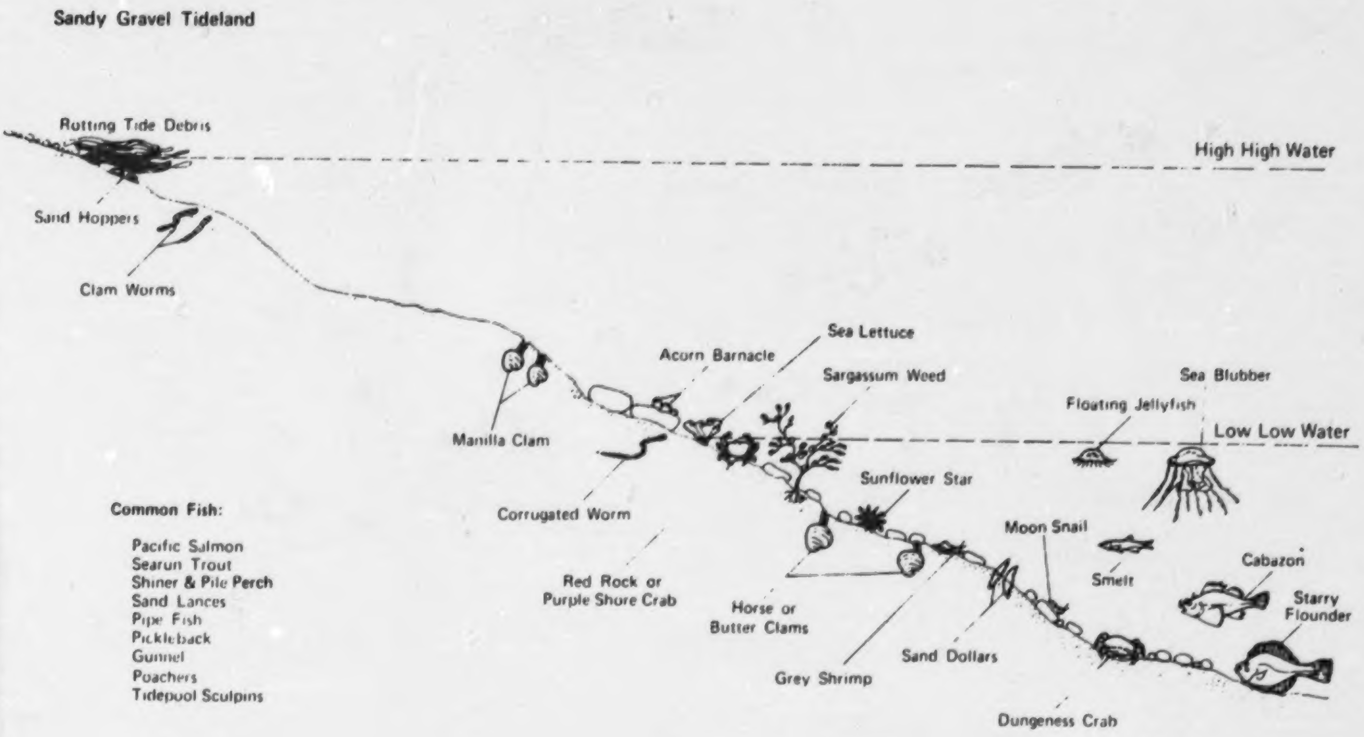
As described in the water resources section of this document, effluent from the Carkeek outfall would be most likely to reach shore during slack water periods when onshore currents develop. During storm periods, the effluent plume is discernible as a depression in salinity and light transmittance for a mile from the outfall. Grease is high in effluent, blocking outfall diffuser ports and reducing effluent dilution. This is of particular concern as over-chlorination occurs regularly in the morning hours producing highly toxic residuals.

The waters off the Carkeek Park service area support marine invertebrates, finfish and marine plants. Figures 2-2 and 2-3 show the types of intertidal and subtidal environments and representative biological assemblages found in adjacent marine waters.

Metro sponsored surveys of the intertidal zone at Carkeek Park identified 178 species of marine invertebrates and 68 species of attached marine algae. Although some differences in marine fauna were noted between Carkeek Park and the other beaches surveyed, there were no readily apparent changes of significance in abundance, species diversity or presence/absence of particular species. The number of species of attached marine flora recorded at Carkeek Park was the least of the five Metro-area beaches surveyed. The significance of this was not determined although it may be attributable to the more uniform nature of the Carkeek Park beach. Overall the diversity and abundance of the biota is indicative of the substrate characteristics of the Carkeek Park service area shoreline.


High High Water
Acorn Barnacles
Leather Chiton
Wrinkled Purple Snail
Limpet
Rockweed
Bull Kelp
Rocky Edges
Purple Shore Crab
Mussel
Blood or Purple Starfish
Hairy Sea Squirt
Rough Anemone
Porcelain Crab
Tube Worm
Low Low Water
Seaperch
Rocky Edges
Hermit Crab
Broken-Back Shrimp
Rockfish
Sea Urchin
Greenling
Dungeness Crab
Leather Starfish
Rocky Edges
White or Orange Sea Cucumber
Octopus
Common Fish:
Rock Sole
Cottids-Cabezon
Pacific Salmon
Smelt
Clingfish
Stickleback
Pipe Fish

Carkeek Park marine communities
Figure 2-2


Sandy Gravel Tideland
Rotting Tide Debris
High High Water
Sand Hoppers
Clam Worms
Sea Lettuce
Acorn Barnacle
Sargassum Weed
Sea Blubber
Floating Jellyfish
Low Low Water
Manilla Clam
Sunflower Star
Corrugated Worm
Moon Snail
Smelt
Cabazon
Starry Flounder
Red Rock or Purple Shore Crab
Horse or Butter Clams
Grey Shrimp
Sand Dollars
Dungeness Crab
Common Fish:
Pacific Salmon
Searun Trout
Shiner & Pile Perch
Sand Lances
Pipe Fish
Pickleback
Gunnel
Poachers
Tidepool Sculpins

Carkeek Park marine communities

Figure 2-3

Recreational clamming has been popular at Carkeek Park, particularly during the low tides of late spring and summer. Hardshell clams and the highly prized geoduck are taken. Total user days on an annual basis are estimated by the Washington State Department of Fisheries to be on the order of 1,200 for the Carkeek Park-Highlands beach areas. Carkeek waters do not meet State fecal coliform standards for commercial shellfish, however.

The lower intertidal zone supports a small eelgrass bed, which is important as a spawning and nursery area for bottomfish.

Current disinfection practices at the treatment plant regularly result in high levels of chlorine residuals in the effluent. These residuals are highly toxic to a wide range of organisms at very low concentrations (Brungs, 1976). The effects of Carkeek effluent residuals upon the biota near the outfall have not been examined. The biota observed may represent more tolerant species.

Although finfish were not sampled off Carkeek Park, the finfish there may be similar to those found off West Point, where a total of 66 species was collected using beach seine and otter trawl. The most common species collected at West Point were Pacific tomcod, shiner perch and English sole, comprising 83 percent of all fish caught by beach seine. Ratfish, English sole, and rock sole were the most abundant species collected at West Point by otter trawl over all depths sampled. Tumors and external nematodes were found during all seasons, with incidence rates of up to 10 to 15 percent. The cause(s) of the observed disease occurrence has not been identified.

Historically, the waters off Carkeek Park have been fished by commercial salmon fishermen using purse seine and gill nets.

Some of the marine birds observed at Carkeek include loons, herons, black brants, and gulls.

Benthic sampling studies indicate changes in sediments and benthic communities off the Carkeek as well as the West Point outfall. Graygreen sediment with an odor of hydrogen sulfide was recovered off Carkeek. The distribution of such sediments at shallow depths in Puget Sound has not been determined, however. The distribution of certain foraminifera, including Buliminella elegantissima which has been connected with outfall sites in California was also found in the typical Carkeek plume area. Certain marine benthic animals, such as clams, snails and worms, appear in greater number of families and individuals along what appears to be the characteristic

Carkeek plume position. These are "tolerant" organisms, often found in increased numbers near outfalls, where the chemistry and structure of the sediment has been altered by an increase in fine sediments and organic matter. It appears that near-shore organism distribution and abundance may be affected by the outfall.

Piper Creek

Piper Creek is a small creek which is impassable to salmon migration upstream. At the same time, the creek is reported to support residual trout, cottids and other stream-dwelling fish species.

NATURAL RESOURCES AND ENERGY

Natural resources and energy impacts are not analyzed on a site-specific basis. Resources and energy consumption occurs on an interrelated basis at the five existing Metro plants and potential new sites. Rather, these considerations are analyzed in the Regional Environmental Impact Statement (Volume I) for the five existing Metro plants and potential new sites.

THE HUMAN ENVIRONMENT

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. This includes such categories as PSCOG Goals and Policies and Transportation Patterns. Such topics can only be analyzed on a regional basis by combining the four main sites plus auxiliary sites (e.g. Cedar Hills sludge disposal site). This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Material in this site-specific document concerns Carkeek Park and its service area.

Land Use

Much of the land in proximity to Carkeek Park has been classified as single family residence, medium security zone

(RS 7200). Commercial development occurs along Holman Road, and there is almost no industrial development in the area. Carkeek Park (zoned as RS 9600) is the largest recreational area in the vicinity; see Figure 2-4.

Eighty-six percent of nearby land is developed; this percent has only slightly increased in the past ten years. Land use pattern has not changed over this same period.

The City of Seattle has a Shorelines Management Program as described in the Washington Shorelines Management Act, which requires a permit of anyone wishing to build a structure exceeding $1,000 in cost, or to alter existing conditions within 200 feet of the shoreline area.

Expansion of the Carkeek Park wastewater treatment facility would not be affected by this program but some segments of the Carkeek Park Connection to West Point or Interbay probably would.

Legal and Institutional

The legal and institutional elements considered include shoreline management regulations, PL 92-500, and U.S. Corps of Engineers permit regulations. The City of Seattle Shorelines Management Program has been previously described. The U.S. Corps of Engineers permits are required for development in designated flood plain zones.

Public Law 92-500 is described in more detail in the Regional EIS. Basically, it would require the installation of secondary treatment facilities. NPDES permits would specify the time schedule for construction; this permit is still being negotiated.

Agency and Neighborhood Goals

Agency goals are described in depth in the Regional EIS. They include the following:

The Puget Sound Council of Governments has proposed the Interim Regional Development Plan, which states:

> "Goal
>
> It is in the public interest to minimize the costs of future growth by encouraging new development

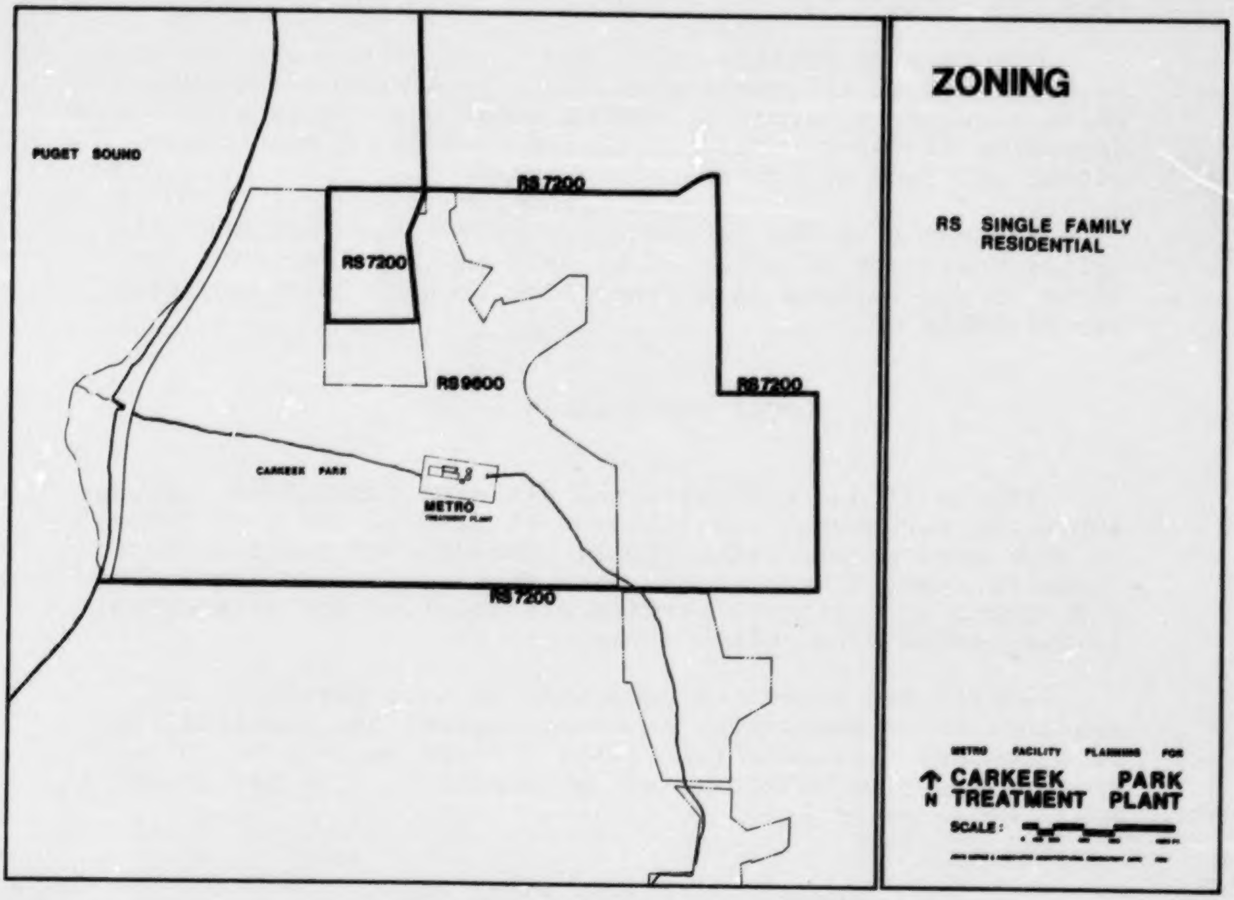

PUGET SOUND
RS 7200
RS 7200
RS 9600
RS 7200
CARKEEK PARK
METRO
TREATMENT PLANT
RS 7200
ZONING
RS SINGLE FAMILY RESIDENTIAL
METRO FACILITY PLANNING FOR
CARKEEK PARK TREATMENT PLANT
N
SCALE :

Figure 2-4

Zoning — — Carkeek Park

within urbanized areas where necessary investments in public services have already been made."

In further expanding on this goal the following policies are included in the proposed document.

"1. Existing public utilities, facilities and services shall be used to their fullest prior to expansion.

3. Encourage conservation efforts and the maximum utilization of utilities and services before increasing supply.

5. The pattern of development which produces the least cost in new public utilities, facilities and services shall be encouraged within feasible limits.

7. Plans for public services shall be consistent with regional growth policies and local comprehensive plans and shall be based upon: 1) Criteria for population and employment distribution; 2) Policies designed to limit demand, 3) Responsible fiscal management."

Another goal of the PSCOG document related to natural environment and amenities is the following.

"1. The natural beauty and liveability of this region shall be a primary consideration in the location, timing and quantity of growth.

    a. Natural amenities identified as important to the regions' character and beauty shall be preserved or sensitively developed as a second choice.

    b. Patterns of development which minimize adverse impacts on these amenities shall be encouraged.

17. Permanent structures designed for human habitation, commerce, employment or public assembly should not be located within high risk zones, including 100 yr floodways, earthquake zones, or active landslide zones.

25. Achievement or maintenance of water quality standards as established by law is recognized

and supported."

City of Seattle

As part of its general review authority, the City of Seattle would review the construction of a sewage treatment plant, rehabilitation of sewer lines or extension of sewage facilities through its Building Department. Two permits are required from the Seattle Building Department for the construction of facilities, including one which examines general design and construction and a second concerning filling and grading activities.

King County

In 1964 King County adopted a Comprehensive Plan. Certain provisions of this plan relate to the Metro Facilities Plan and are included as follows:

> "Utilities Development Policies
>
> Trunk utility lines should be installed in advance or at the time of development in accordance with the general plan for the area. Local or service utility lines should be installed as needed.
>
> Where pollution conditions now exist, all possible steps should be taken to correct such conditions."

Goals for Seattle, a report prepared by the Citizens of Seattle and adopted by the Mayor and the City Council:

> "D. Goal: Water
>
> The City should undertake all means reasonable and feasible to insure water purity to meet health standards and protect the environment.
>
> 1. Undertake efforts to meet Federal Water Pollution Control Act requirements by 1984.
>
> a. It is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985.
>
> b. It is the national goal that wherever attainable, an interim goal of water quality which

provides for the protection and propagation of fish, shellfish, and wildlife,and provides for recreation in and on the water be achieved by July 1, 1983.

6. Insure clean water to protect wildlife, vegetation and recreation areas."

Citizen opinion surveys were conducted by HRPI, Gerhardt Research, and Quality Controlled Services in the Carkeek Park region.

Quality Control Services interviewed 100 park users on Labor Day weekend, 1976 to ascertain the attitudes of park users toward treatment plant operation and expansion. Thirty of the people interviewed had noticed unusual odors, but only eleven related the odors to the sewage treatment plant. Half of those interviewed could correctly identify the sewage treatment building. The beach and picnic areas were used by the most people and the most often. Forty-seven people recommended expansion along Piper Creek, if expansion were necessary. Twenty-eight preferred that the creek and trail be protected by directing expansion into the picnic area. Another sixteen felt the plant should be moved out of the park all together and nine had no opinion.

When randomly chosen citizens were asked, in a Gerhardt survey, what environmental concerns needed most attention, most responded that they could think of none. Those who did have an environmental concern mentioned such things as park upkeep, heavy traffic on streets, noise, or litter. Although a few mentioned water quality, none directly pointed out any of the wastewater treatment facilities as a most serious environmental problem.

Most of the 370 people interviewed knew of the treatment facility (75%); only 52% of those who have lived in the area less than five years knew of the facility. It concerned few people (4%). When asked if they would favor upgrading sewage treatment facilities as required by the law, the majority said, "yes" (54%). Most who opposed were concerned about cost, necessity, or location of the facility. The highest number (42%) felt that "cleaning up the environment" was most important compared to such local issues as the fitting in with the environmental setting (19%) or the encroachment on trails (11%) or picnic areas (14%). The consideration of upgrading or expanding the facility was not clear cut. According to Gerhardt Research, the sampling method used allowed these results to be estimated at the 95% confidence level; individual results are accurate to within 5% of the stated number (HRPI, 1976).

Environmental Setting

HRPI (Metro's socioeconomic consultant for the EIS) and Metro's community involvement staff conducted informal meetings which were attended by citizens of the Carkeek Park area explicitly concerned about the water treatment facility. In general, this group felt more strongly than those randomly interviewed by Gerhardt Research that Carkeek Park is not well located. They felt that wastewater facilities should not be in prime park land, but rather in industrial regions. Residents said that unpleasant odors sometimes occurred.

Economics and Costs

A description of how costs are determined is developed in the Regional EIS. In summary, costs, whether existing or proposed, include three components: capital cost, operating and maintenance costs, and total annual costs.

The capital costs include the initial expenditures for construction of wastewater treatment plants, sewage collection systems, effluent disposal methods, combined sewer overflow facilities, sludge handling and disposal techniques, plus the purchase of land and miscellaneous treatment-related equipment. These capital costs typically are major expenses that are made infrequently and that can be phased to suit planning requirements. Because capital or construction costs can require large sums of money at one time, they are often financed by bonds or other types of loans that are paid back, with interest, over a period of several years. The yearly payment on the original capital cost debt is referred to as the annual cost of capital or amortized cost.

Operation and maintenance costs include expenses such as wages for labor, purchase of chemicals and power, and replacement or repair of equipment. These costs occur continually or at frequent intervals during the life of the project.

The total annual cost of wastewater facilities is the sum of the annual payment on amortized capital and the annual operation and maintenance costs. The payment of total annual costs can be achieved by various means, including charges to persons who use the services.

Since user charges are determined regionally, they are discussed in the Regional EIS.

Environmental Setting

Employment

Employment considerations are developed in the Regional EIS.

Social, Recreational and Cultural

The aspects considered in the social, recreation and cultural category include neighborhood values and attitudes, shoreline use and cultural patterns.

Carkeek Park, with 192 acres, is the largest recreational area in the vicinity. It is used by about 57% of the residents over 18 years old who live close by (Gerhardt Research, 1977). It contains picnic grounds, forest, Piper's Creek, a nature trail made by scouts, beach access, an archery range, and an outdoor amphitheater.

One local resident has stated that, "Piper's Creek had been designated as a 'children's fishing area', but recently, the fish supply has diminished due to structural modification of the creek related to the Sewage Treatment Facility."

The original (1918-1926) Carkeek Park was on Pontiac Bay on Lake Washington. It was the gift of Mr. and Mrs. Morgan J. Carkeek. However, in 1926, the federal government condemned all of the Sand Point area as the site for a Navel Air Station. Not long afterward the present Carkeek Park was developed with the city's purchase of the area then known as "Piper's Canyon". Little development occurred until 1953 and the park was not formally dedicated until June 30, 1955. In 1949, the Greenwood Sewer District won a condemnation award to establish a sewage treatment plant in the park. The plant was built by Metro in 1962-1963 and began operations in 1963 (HRPI, 1976).

Cultural patterns in the Carkeek Park area are somewhat independent of the Carkeek Park treatment facility - its presence only concerns 4% of local residents (Gerhardt Research, 1977). Currently, this neighborhood is predominantly white, upper middle class. The presence of the facility has no bearing on beach use, but may affect water quality there.

Archeological and Historical

As stated by the Office of Public Archeology, "The

Environmental Setting

Carkeek Park Treatment Plant is currently occupied by several Metro structures. Given the surficial disturbances occasioned by this site's initial development, we would again anticipate no further adverse archaeological impacts."

There are no registered historical sites which would be affected.

Health and Safety

Health and safety considerations include:

- Occupational safety
- Public health and safety related to the treatment facility and discharge point
- Existing health effects of combined sewer overflows
- Sludge handling
- Various construction areas such as the storage and transport of explosive or caustic chemicals

The occupational safety record is generally in compliance with all applicable regulations.

The public health and water quality implications of sludge handling are described in the sludge management and groundwater portions of the Regional EIS.

Sludge trucks must travel on roads that are narrow, winding, and hazardous even for automobile traffic.

Aesthetics and Nuisance

Some local residents feel that the Carkeek Park Wastewater Facility is incompatible with the park setting, even when the facility is partially hidden. Further, they say its location on flat ground prevents picnic ground development or road construction. Most, however, feel that the facility is not that much a nuisance. One woman said that when she takes guests to the park, often they are unaware of the facility's presence. Some people had noticed an odor from the facility, but none were concerned about its noise (Gerhardt Research).

The sludge trucks were considered unpleasing by some, and unnoticed by others.

CHAPTER III

ALTERNATIVES AND IMPACTS

The alternatives developed in the Draft Facility Plan are described briefly in this chapter and evaluated in terms of monetary cost, environmental impacts, and relation to the more important objectives of the study area. These planning objectives include: (1) provision of capacity to serve the wastewater needs of the area through 2005;(2) protection and/or enhancement of receiving water quality; (3) compliance with the legal requirements of PL 92-500; (4) control of combined sewer overflows and; (5) development of effluent reuse.

The environmental impacts of the alternatives discussed in this chapter cover all the elements of the environment discussed in Chapter II. However, emphasis will be on the following issues as related to Carkeek Park: (1) the effects of alternative treatment processes (primary, enhanced primary and secondary) on water quality, biology, and public health.

In this chapter, the alternatives for Carkeek Park and their impacts are discussed in detail.

A general statement of the Facility Plan objective, the major issues involved, and methodology for selecting alternatives are discussed briefly below.

The impacts of each alternative, both primary and secondary, on the physical, biological and human environments are discussed after a brief description of the alternative. Other issues related to each alternative such as mitigation measures and unavoidable impacts are also discussed.

DEVELOPMENT OF THE ALTERNATIVES

Of the regional issues addressed in the Regional

Analysis, Volume I, the two major issues applicable to Carkeep Park were (1) protecting the water quality of Puget Sound an (2) upgrading the present facilities to secondary treatment in compliance with the requirement of PL 92-500. Local issues related to the treatment plant site and the present operation are also of major concern in the selection process of the wastewater management alternatives.

Treatment Plant and Process

Various processes could be employed to upgrade the existing treatment facility. Chemical addition by enhanced primary treatment would improve the solids removal efficiency of the plant; however, the organics removal would not be enough to meet the secondary treatment requirement. Upgrading to secondary treatment could be achieved by various processes such as trickling filters, rotating biodiscs, and activated sludge. Based on the pilot studies conducted by Metro and experience that indicates activated sludge is reliable and effective, activated sludge was selected as the secondary treatment process for Carkeek Park alternatives.

Upgrading the present facilities to the secondary treatment level would require additional area for accommodating the new processes. Since the plant is located in a park, such expansion could involve adverse aesthetic impacts. There are also legal restrictions on the uses for park land. The access road is subject to traffic congestion.

Therefore, some alternatives for Carkeek Park were developed that would not require plant expansion. Converting the plant to wet weather treatment only, with the possibility of abandonment (probably by 1995, depending on sewer separation efforts by the City of Seattle) was one alternative chosen to consider site constraints at Carkeek Park. Enhanced primary treatment would also be possible without site expansion.

Service Area and Growth

Other issues such as service area configuration, interceptor requirements and growth are irrelevant to Carkeek Park alternatives selection. Due to the topography of the area and the existing collection system drainage pattern, the service area would be maintained the same in all alternatives. Future development would consist of filling the partially developed areas, and no major interceptors would be required.

Costs

Although cost is an important constraint in evaluating alternatives, it is a regional, rather than a local, issue. Due to the Metro wastewater pricing policy of uniform service charges, the cost allocated to residents of Carkeek Park does not reflect the cost of the Carkeek Park facilities alone, but is Carkeek Park's share of the total cost of the regional wastewater management system.

Flow and Waste Reduction Measures

Flow and waste reduction measures include such items as domestic water conservation techniques, collection system rehabilitation to reduce infiltration and inflow, and industrial pretreatment of wastewater. Industrial waste reduction, in both volume and strength, can also reduce loads on present and future facilities and prevent the introduction of toxic or undesirable pollutants into the wastewater stream where they may disrupt treatment processes or contaminate either the discharged effluent or the waste residuals. Such measures, if found acceptable and economical, could decrease system operations and maintenance costs, extend the useful life of existing wastewater collection and treatment facilities, and reduce the size and therefore the costs of future facilities.

Domestic Water Conservation

As discussed in the Regional Analysis, Volume I, the reduction in wastewater flows through adoption of domestic water conservation and reuse measures is insignificant in affecting plant sizing or costs in a combined service system with high rates of infiltration/inflow. This is clearly evidenced in the Carkeek Park collection system where infiltration and inflow can be as high as 4.3 and 18.0 mgd, respectively, while the base wastewater flow is only 1.6 mgd.

The implementation of domestic water conservation measures is being studied by Metro. At this time, the Draft Facility Plan does not make provision for any future wastewater reduction through domestic water conservation measures due to their limited effect on plant site or costs for Carkeek Park.

Infiltration and Inflow

A detailed infiltration/inflow (I/I) analysis was conducted on the Carkeek Park collection system. Although over 90 percent of the collection system is a separate system, wet weather flows sometimes exceed 20.0 mgd due to infiltration/inflow. Based on a total dry weather wastewater flow of 1.6 mgd (not including infiltration/inflow), the results of the analysis showed that tributaries' system infiltration varied from 0.5 mgd during the summer season, to a maximum of 4.3 mgd during the peak of the rainy season. Inflow rates vary with the intensity of specific storms. The maximum rate recorded was over 18.0 mgd.

To assess whether the I/I is excessive or not the estimated cost of removing incremental percentages of infiltration/inflow from the collection system and the cost of transporting and treating the flows if not removed were compared. On this basis it was concluded that reducing the inflow to the level determined to be economical would reduce peak flows at the treatment plant from 26 mgd to 12.5 mgd. The estimated cost of achieving this reduction is $2,570,000 and the expected savings are $2,670,000 in capital costs and $15,000/year in operation and maintenance costs.

Since roof drains connected to the sanitary sewers are a major source of inflow, the City of Seattle adopted codes which prohibit new construction from connecting roof drains to the sewers. Other measures that can be adopted to reduce future I/I would be the provision of efficient storm water collection facilities and sealed storm water transfer lines and ditches which will reduce the possibility of these waters entering the sanitary sewer system. Points at which storm sewers and surface drainage ditches cross sanitary sewers have been sources of infiltration/inflow. Localized ponding, in addition to being a potential inflow source, causes upper groundwater tables to become a potential infiltration source. Elimination of these sources of I/I would reduce the flow reaching the treatment facility.

Pretreatment

Pretreatment efforts generally focus on industrial or commercial contributors of pollutants. Since the Carkeek Park treatment plant does not receive any industrial or commercial waste of this nature, pretreatment cannot be considered as a method in reducing flow or pollutant loading to the plant.

Beneficial Use of Reclaimed Water

As discussed in the Regional Analysis (Volume I), water reclamation did not appear attractive according to the Draft Facility Plan in the Seattle metropolitan area, where abundant local sources of high quality water offer greater potential at lower cost. As it applies specifically to the Carkeek Park service area, the absence of industries and agricultural lands further diminishes the potential for reclaimed water re-use.

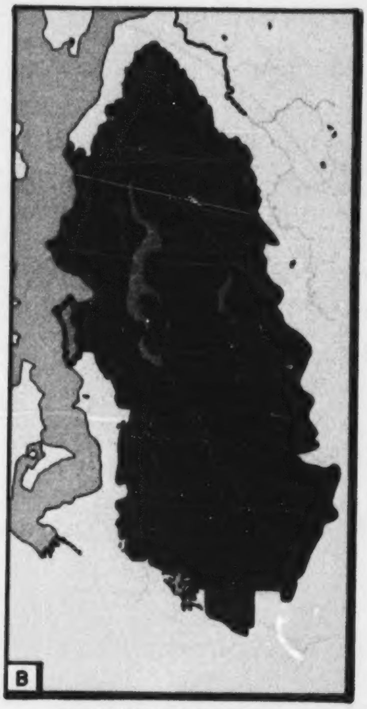
REGIONAL ALTERNATIVES

Eight alternatives on the regional level are being considered and evaluated by the 201 Facility Plan. These alternatives differ in the degree to which issues such as cost, water quality, and compliance with federal and local policies and goals are addressed. The regional alternatives consist of one "no-action" alternative, one alternative which continues unchanged the present comprehensive plan for the study area, two which emphasize combined sewer overflow abatement with minimal treatment upgrading, and four alternatives which achieve secondary treatment with variations on combined sewer overflow controls, site impacts and reuse options. The secondary treatment alternatives E through H are the only alternatives that comply with the secondary treatment requirements of PL 92-500. The eight alternatives are described below and shown in Figure 3-1.

Alternative A - No Action

No capital expenditure would be made for expansion, modification or upgrading of treatment plants and no construction of new interceptors during the planning period (until 2005). Alternative A is evaluated to meet SEPA "no action" requirements.

NO ACTION



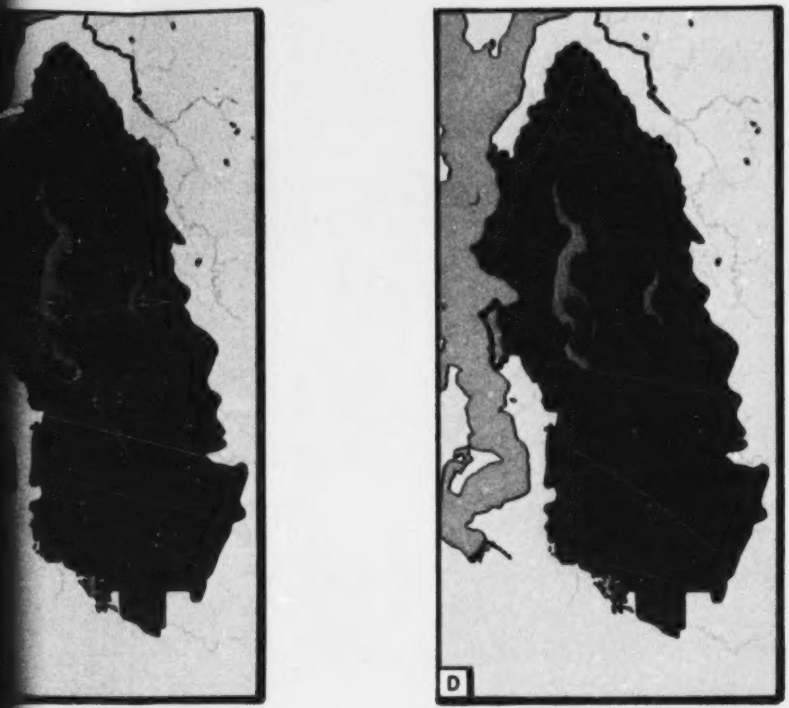
COMPREHENSIVE PLAN
(NO ACTION PURSUANT
TO PL 92-500)

MAJOR CSO CONTROL

SECONDARY

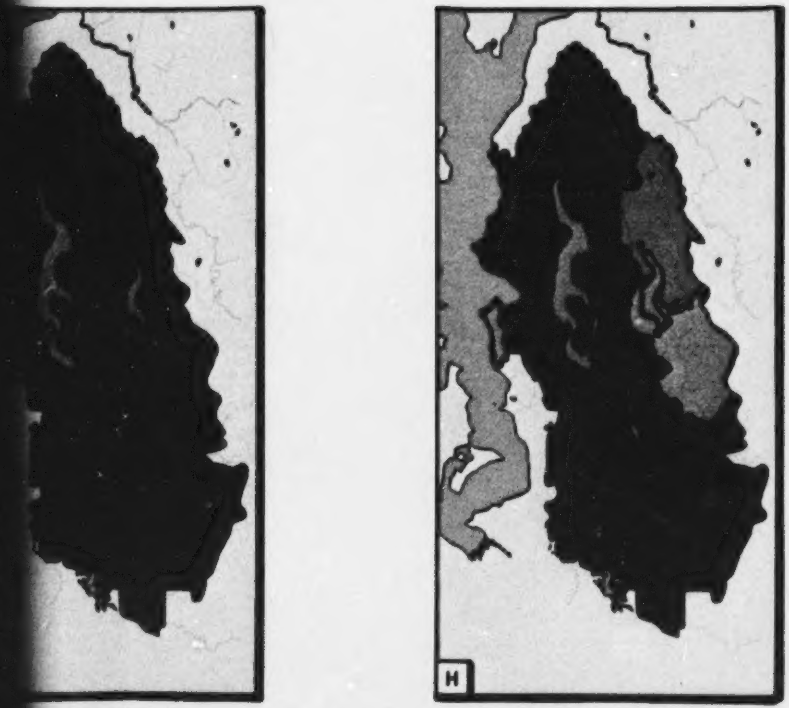
SECONDARY
SOUTHERN STRATEGY

SECONDARY
WEST POINT PHASE OUT
OPTION



OR CSO CONTROL

PARTIAL CSO CONTROL



SECONDARY
POINT PHASE OUT
OPTION

DECONSOLIDATION
RECLAMATION

LEGEND

- ■ RENTON
- ■ WEST POINT
- ▨ DUWAMISH (STORMWATER)
- ■ DUWAMISH (WASTEWATER)
- ■ ALKI
- ■ RICHMOND BEACH
- ■ CARKEEK PARK
- ■ NORTH LAKE WASHINGTON
- ■ NORTH LAKE SAMMAMISH
- ■ SOUTH LAKE SAMMAMISH
- ■ PRESENTLY SERVED BY OTHERS

- ● WASTEWATER TREATMENT PLANT
- ○ STORMWATER TREATMENT PLANT

Figure 3-1

Metro 201 Facility Plan
Service Area Alternatives

Alternatives and Impacts

Alternative B - Metro Comprehensive Plan (No Action Pursuant to PL 92-500)

Plant upgrading and transfer interceptor construction would be done according to the Metro Comprehensive Plan. Alternative B is evaluated as the "no action" alternative pursuant to PL 92-500 and NEPA requirements and serves as the baseline for other alternatives. Puget Sound plants (West Point, Alki, Carkeek Park and Richmond Beach) would be retained with primary treatment. Improved sludge management and disinfection practices would be provided in Alternative B and all following alternatives. Four new transfer interceptors and improvements to the Alki outfall would be included.

Alternative C - Major Combined Sewer Overflow Control

Major portions of combined sewer overflows would be controlled by transfer from fresh to saltwater and/or treatment. The existing Puget Sound plants would be upgraded to provide enhanced primary treatment by physical/chemical treatment of solids during the summer. A new wet weather enhanced primary treatment plant would be constructed in the lower Duwamish industrial area and the Alki plant would be abandoned, both in 1995.

Alternative D - Partial Combined Sewer Overflow Control

Wet weather combined sewer overflows would be reduced to Lake Washington, Lake Union and the West Seattle shoreline. The four Puget Sound plants would be upgraded to enhanced primary treatment with chemical addition during the summer for improved solids removal.

Alternative E - Secondary

Secondary treatment would be added to the West Point, Alki and Richmond Beach wastewater treatment plants by 1985. The Carkeek Park plant would provide primary treatment for wet weather flows only, beginning in 1985; dry weather flows would be pumped to West Point. The Carkeek Park plant would probably be abandoned by 1995, depending on the City of

Seattle's sewer separation program.

Alternative F - Secondary/Southern Strategy

Secondary treatment would be provided at Richmond Beach and West Point (with a reduced service area). A major new secondary treatment facility would be constructed in the Duwamish industrial area in 1985; the Alki plant would be abandoned at that time. A new outfall off Alki Point would be built for discharging effluent from the Duwamish (and Renton) plants. The Carkeek Park plant would provide primary treatment for wet weather flow only, beginning in 1985; dry weather flows would be pumped to West Point. The Carkeek Park plant would probably be abandoned by 1995, depending on the City of Seattle's sewer separation program.

Alternative G - Secondary/West Point Phaseout Option

Secondary treatment would be provided at the Alki and Richmond Beach plants. West Point would continue as a primary treatment plant for wet weather flows only, beginning in 1985. A new secondary treatment plant in the Interbay area (Commodore Way or Golf Park sites) would be constructed. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning 1985; dry weather flow would be pumped to Interbay. The Carkeek Park plant would probably be abandoned by 1995, depending on the City of Seattle's sewer separation program.

Alternative H - Deconsolidation/Reclamation

Secondary treatment would be provided at West Point, Alki, Carkeek Park and Richmond Beach. Areas of growth would be served by new inland plants with local effluent and sludge re-use possible. Advanced waste treatment would be provided at new North and South Lake Sammamish plants. A new secondary plant at Kenmore would discharge treated effluent to Puget Sound.

A summary of information pertaining to the Carkeek Park treatment plant alternatives is presented in Table 3-1. More details are described in the following sections on each alternative. Because of similarities in implementation at the Carkeek Park site, the regional alternatives can be grouped

TABLE 3-1

CARKEEK PARK
-SUMMARY OF ALTERNATIVES-

ALTERNATIVE

	A	B	C and D	E, F, and G		H
				Phase I	Phase II	
Treatment Process	Primary	Primary	Enhanced Primary (1985)	Primary (1985)	Abandoned (unspecified date)*	Secondary Activated Sludge (1985)
Plant Capacity (Average/Peak)	3.5/20	3.5/20	3.5/20	0/20	0/0	3.5/12.5
Effluent Discharge Site	Puget Sound	Puget Sound	Puget Sound	Puget Sound (wet weather); to West Point Interbay (dry weather)	To West Point or Interbay	Puget Sound
Sludge	Digested on-site; trucked to Interbay Pumping Station	Digested on-site; trucked to Interbay Pumping Station	Digested and dewatered on-site; hauled to landfill	Digested on-site; trucked to Interbay Pumping Station	None	Digested and dewatered on-site; hauled to landfill

*Probably by 1995, depending on sewer separation efforts by the City of Seattle into categories: no action pursuant to SEPA (Alternative A), no action pursuant to NEPA (Alternative B), enhanced primary (C and D), wet weather primary (E, F and G), and secondary treatment (H).

ALTERNATIVE A
NO ACTION

General Description

In the no action alternative for Carkeek Park, the existing conditions would be allowed to continue without any further expansion or upgrading. This alternative serves as a base for planning additions and modifications to the existing facilities by establishing the adequacy of such facilities and the minimum requirements for their best performance.

The following sections describe the service area, collection system wastewater treatment facility, and sludge management system under existing conditions, which correspond to the no action alternative.

Service Area

The Carkeek Park wastewater treatment plant serves a residential area of approximately 4350 acres located in the northwest corner of the City of Seattle. The service area is bounded by Puget Sound to the west, 85th Street to the south, Fremont Avenue to the east, and 145th Street to the north, as shown in Figure 3-2. The service area is primarily residential with a 1975 population of 25,000; the sewered population is 23,000. There are no industries or major fresh water bodies within the service area.

Collection System

The Carkeek Park collection system is divided into two principal systems: (1) the areas tributary by gravity to the North Beach pumping station and (2) the areas tributary by gravity to the Carkeek treatment plant.

Approximately 630 acres of the system drain by gravity to the North Beach pumping station located at N.W. 100th Street and Triton Drive, N.W. The pumping station was constructed in 1962-1963 to replace a small primary treatment plant that served this area. Three small local pumping stations serve other portions of the areas along the waterfront. The flows are pumped from North Beach via a force main about 7,000 feet along the waterfront and up Piper Creek Canyon to the treatment plant. The 4.5 mgd capacity of the

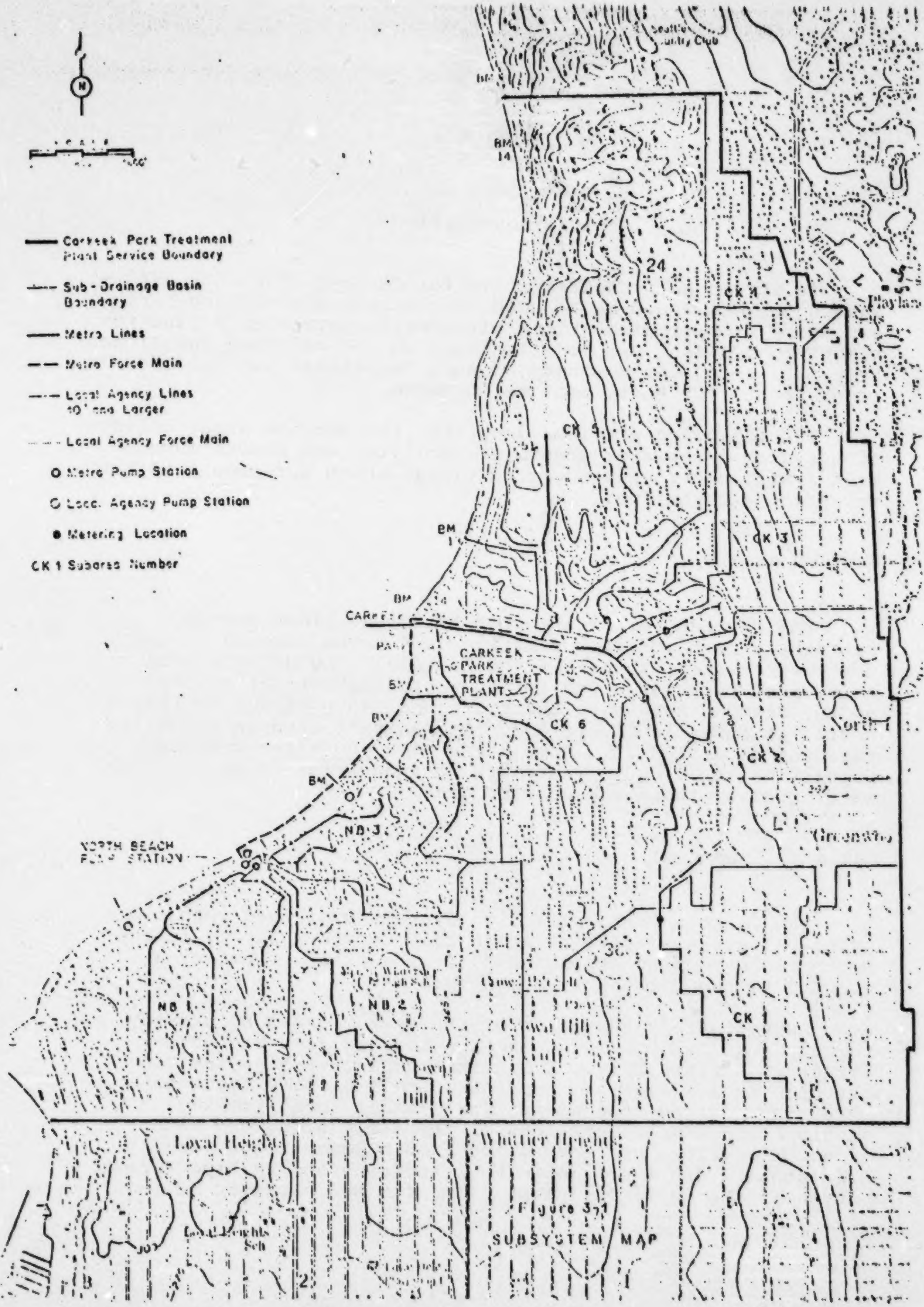

N
SCALE
Carkeek Park Treatment Plant Service Boundary
Sub-Drainage Basin Boundary
Metro Lines
Metro Force Main
Local Agency Lines 10" and Larger
Local Agency Force Main
Metro Pump Station
Local Agency Pump Station
Metering Location
CK 1 Subarea Number
Seattle Country Club
BM 14
24
CK 4
Bitter L
Playland
CK 5
BM
CK 3
BM
CARKEEK PARK
CARKEEK PARK TREATMENT PLANT
CK 6
North
CK 2
BM
NB 3
NORTH BEACH PUMP STATION
Greenwood
30
NB 1
NB 2
Crown Hill
CK 1
Loyal Heights
Whittier Heights
Figure 3-1 SUBSYSTEM MAP
Loyal Heights Sch

FIGURE 3-2 Service Area

North Beach pumping station is exceeded during rainy periods, resulting in combined sewer overflows through the old treatment plant's 15-inch outfall to Puget Sound. The area not served by North Beach, approximately 1800 acres, flows by gravity to the Metro interceptor or force main which runs through Piper Creek Canyon.

Sewers in the area were first constructed in 1930; most of the system was installed in the 1950's and early 1960's. Although over 90 percent of the surface area is on a separate sanitary system, flows in excess of 20.0 mgd have occurred due to infiltration/inflow during wet weather.

The Carkeek Park treatment plant service area sewers are maintained by the City of Seattle. The most frequent problems are root intrusion and grease build-up.

Except for the North Beach pumping station, the existing collection system at Carkeek Park is adequate to handle the peak wet weather flows generated in the area. The North Beach pumping station receives flows during wet weather in excess of its 4.5 mgd design capacity, resulting in combined sewer overflows. To eliminate the overflow, either the pumping station could be enlarged to handle the peak wet weather flow of 8.0 mgd or the infiltration/inflow could be reduced. Based on the I/I analysis conducted on the Carkeek Park collection system, reduction in I/I under the present wastewater collection and treatment conditions would not be economical; however, with upgraded treatment under some other alternatives, reducing infiltration and inflow would appear to be cost effective.

Wastewater Characteristics

The following sections describe briefly the wastewater quantity and quality in the Carkeek Park area and the existing treatment facility and its adequacy under the present conditions.

Wastewater flow. Due to the variation in the amount of infiltration/inflow into the collection system, flow data collected for a three-year period, 1973 to 1975, indicates that the monthly flow fluctuated between 1.75 and 6.06 mgd. Average flow over this period was 3.4 mgd. The peak daily wet weather flow recorded for this period was 11.81, while peak hourly wet weather flows were in excess of 20.0 mgd. In contrast, the existing treatment facility is designed for an average daily flow of 3.5 mgd and peak hourly wet weather flow of 20.0 mgd.

Wastewater quality. In the Carkeek Park service area, the collection system is relatively new and the land use primarily residential, with some commercial activity. These conditions produce a moderately concentrated sewage during summer months when the infiltration/inflow into the sewer system is at a minimum.

Annual average 5-day biochemical oxygen demand (BOD) of influent wastewater to the plant during the three-year (1973 to 1975) period was 129 mg/l. This gives a monthly flow-weighted BOD loading of 3,500 pounds per day. The highest recorded monthly concentration was 164 mg/l in October 1974; a loading of 2,400 pounds per day. In general, the BOD concentration of the wastewater varies inversely with flow throughout the year.

The mean suspended solids concentration of the influent stream over the three-year period was 142 mg/l. A peak monthly value of 230 mg/l was recorded in that period. Monthly flow-weighted suspended solids loadings were 3,800 pounds per day. Daily flow-weighted loadings should give a slightly lower average loading. The suspended solids concentrations vary inversely with flow because of the effects of dilution, but suspended solids loadings show no characteristic seasonal variations.

Of particular significance in the Carkeek Park influent is the large quantity of grease present and its unusual quality. The source of the grease has not been determined, however it has caused serious operational problems and degraded the effluent quality. The diffuser ports on the submarine outfall as well as sludge lines tend to get plugged up periodically and require cleaning. Grease also builds up on the walls of the chlorine contact channel at the water surface and the addition of chlorine seems to raise the grease to the surface and visually degrade the effluent.

Adequate records for metal concentrations in the Carkeek Park influent flow are not available. However, recent analysis of composite samples of the effluent revealed the following concentrations in mg/l:

Cd	Cr	Cu	Hg	Ni	Pb	Zn
0.004	0.01	0.080	0.0007	0.02	0.07	0.39

Data on nitrogen and phosphorous concentrations in the Carkeek Park influent and effluent are not available.

Carkeek Park Treatment Plant

The existing treatment plant was constructed in 1962 on a rectangular site 250 feet wide by 500 feet long currently owned by Metro. The present plant structures are located in the western two-thirds of the property. The only vehicular access to the plant is off Piper Canyon Road. Structures shown in Figure 3-3 include the round digester tanks, sedimentation basins, and the operations building.

The Carkeek Park plant currently provides primary treatment by settling solids from wastewater. Flows in excess of plant capacity are diverted through a bypass line to the effluent conduit and diffuser directly to Puget Sound. A prechlorination injection diffuser is located upstream of the bypass structure. The rate of chlorination is controlled manually. Wastewater is discharged through an outfall to Puget Sound 2,100 feet offshore, which terminates in a 50 foot diffuser section at an average depth of 200 feet. More details on the plant are described in the Draft Facility Plan.

For the period 1972 - 1974, the Carkeek Park treatment plant was reported to remove 38 to 43 percent of BOD loadings and 57 to 73 percent of the suspended solids from the incoming wastewater. These reported removal figures are consistent with those expected for primary treatment, which generally removes 25 to 40 percent of BOD and 50 to 65 percent of the suspended solids from wastewater.

Although the maximum hydraulic capacity of the existing treatment plant is 20 mgd, its BOD and suspended solids removal efficiency drop appreciably as the flows exceed the design capacity of the primary sedimentation tanks, based on average dry weather flows of 3.5 mgd. Flows in excess of 20 mgd bypass the plant untreated.

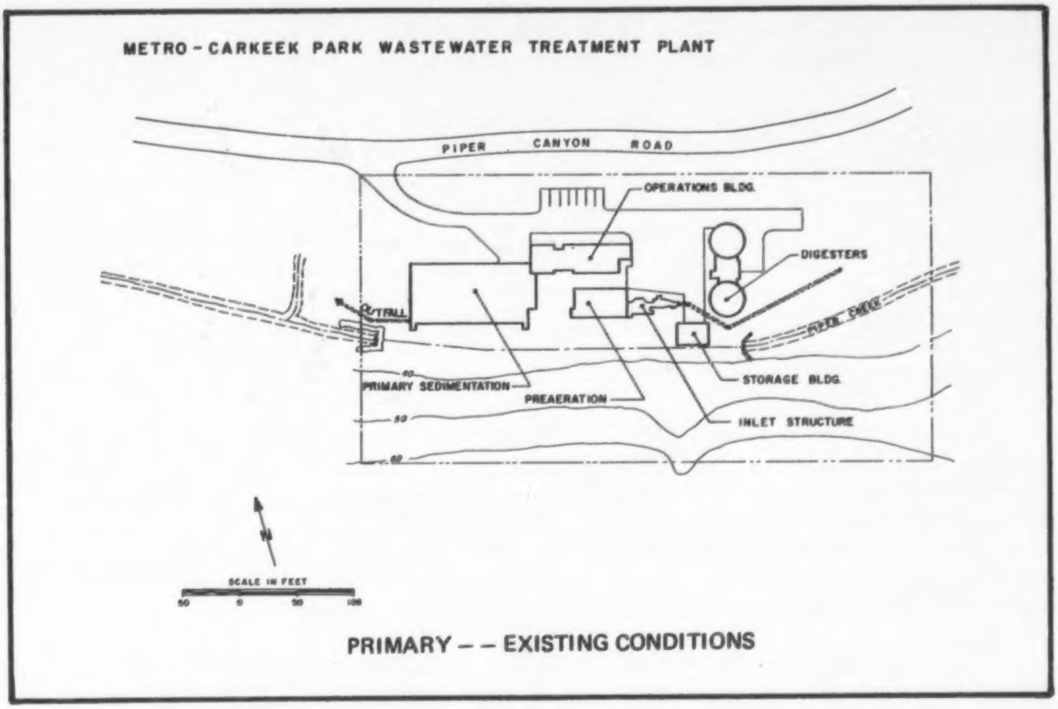

METRO - CARKEEK PARK WASTEWATER TREATMENT PLANT
PIPER CANYON ROAD
OPERATIONS BLDG.
DIGESTERS
OUTFALL
PIPER CREEK
STORAGE BLDG.
PRIMARY SEDIMENTATION
PREAERATION
INLET STRUCTURE
40
50
60
N
SCALE IN FEET
50
0
50
100
PRIMARY -- EXISTING CONDITIONS

Figure 3-3

Carkeek Park Treatment Plant
Layout -- Alternative A

Odors at the plant have been controlled by prechlorination, postchlorination, combusting waste digester gas, and a carbon adsorption system. However, some residual odors remain.

Adequate disinfection of the effluent cannot be attained under the present conditions. Fecal coliform counts occasionally violate state standards near the shoreline in the vicinity of the plant and the outfall plume; although the source of bacteria has not been determined, the plant discharge is a logical candidate. Chlorine feeding is adjusted manually on a daily basis. Hourly fluctuations in flow result in a varying chlorine dosage rate. A low dosage rate results in poor disinfection of the effluent, while a high dosage rate results in unnecessarily high chlorine residual. The size of the chlorine feeding equipment is not adequate for the higher flows reaching the treatment plant. At a wet weather flow of 20 mgd, the feed rate is about 1.5 mg/l, which would have little or no disinfecting effect. A dosage rate of 10 to 15 mg/l is required for effective disinfection of primary treatment effluent, provided adequate mixing and contact are available. However, adequate contact time is not available during wet weather flow conditions at the plant.

The plant is provided with means for complete bypass of the plant during emergency conditions, authorized by the NPDES permit during severe weather conditions. Since the flow through the plant is by gravity and stand-by power for the major equipment is rapidly available, the occurrence of such bypass is rare.

Since the plant provides primary treatment only, the unit operations involved are rather simple to control and operate and can be considered reliable. Adequate surveillance is also provided. The plant is staffed seven days a week, eight hours a day. When staffed, critical processes at the plant are monitored at the main control center at West Point.

Sludge Characteristics and Management

The Carkeek Park plant has on-site facilities for sludge digestion, but not for sludge dewatering. Digested sludge is trucked to the Interbay pumping station for transmission by sewer to West Point, where solids are given primary treatment. West Point digested and dewatered sludge is then trucked to Cedar Hills landfill and to Pack Forest for recycling experiments.

Alternatives and Impacts
Alternative A

The two sludge digesters are adequate to meet present needs. The sludge from the primary sedimentation tanks is partially stabilized prior to being hauled away. Sludge gas is recovered and used to heat sludge for more effective digestion.

The solids content of Carkeek's digested sludge fluctuates between 2.2 and 11.9 percent, with a mean monthly average of 6.0 percent. Solids concentrations vary with seasonal changes. Wet weather conditions yield sludges with solids concentrations more than twice as high as those produced during dry periods.

On the average, sludge from the Carkeek Park treatment plant amounted to approximately 0.6 tons of dry solids/day in 1975. Sludge from Carkeek Park and Richmond Beach treatment plants are usually collected on the same day to make full use of the trucks and minimize hauling. The Carkeek Park plant requires one sludge truck trip per day.

Impacts

Primary impacts only are discussed here. Secondary impacts are evaluated in the Regional EIS.

Geology, Soils, Topography

Because the No Action alternative would include no construction of new facilities, there would be no impacts relative to geology and soils other than a small continued risk of earthquake damage from seismic activity.

Air Quality and Odors

Continued operation of the Carkeek Park plant should have no impact on local atmospheric conditions or air quality. Odors would continue to be an occasional annoyance to users of Carkeek Park. Aerosols and pathogens are not believed to be a problem. The impact on particulates or other air quality constituents from 1.2 sludge haul trips per day is judged to be negligible.

Water Quality Impacts

Under the No Action Alternative, by 2005 the average daily flow to Carkeek Park would increase from 2.2 to 2.9 mgd, and the diurnal peak from 3.4 to 4.6 mgd. In the latter case, and during peak hour flows, the influent flow would also exceed the 3.5 mgd average plant design capacity, resulting in lowered removal efficiency for BOD, suspended solids and other contaminants and higher loadings to the Sound. Such overload would also tax the present disinfection system.

Although there is no evidence of nutrient enrichment in waters near Carkeek Park, the discharge of primary effluent will continue to add nitrogen and phosphorus to Puget Sound. The adverse impacts of the Carkeek Park discharge on Puget Sound water quality are expected to be minor, because the volume is relatively small; limited to waters near Carkeek Park; long-term, because the discharge would continue through the planning period; and, except for the accumulation of toxicants and heavy metals, reversible. The impacts could be somewhat worse, however, if, during part of the tidal cycle, currents carried diluted effluent toward shore.

The impact of heavy metals at Carkeek Park is also judged to be minor. The present discharge data (Metro Engineers 1977) indicates mercury at 0.0007 mg/l in the effluent exceeds the proposed EPA water quality standards for marine life of 0.0001 mg/l (EPA,1975). The cadmium in Carkeek Park effluent averages 0.004 mg/l and approaches the EPA recommended limit for marine salmonids of 0.005 mg/l. Effective dilution of effluent at the diffuser would bring both of these concentrations to below acceptable levels. If grease buildup sufficiently blocks diffuser ports, the design dilution ratio may not be reached. The accumulation of heavy metals in sediments makes the adverse impact irreversible.

Biology

Terrestrial habitats. There would be no impact on terrestrial biology under Alternative A as no construction would be involved.

Puget Sound. Under Alternative A, discharge of primary effluent to Puget Sound would continue, with no improvement in disinfection. Bypassing would continue at North Beach Pump Station.

Effluent on the beach, especially if over-chlorinated could have a minor adverse impact on local intertidal flora and fauna. Shellfish beds would continue to be impacted by existing microbial quality. Eelgrass beds which are intertidal-subtidal would probably be exposed to effluent at lower dilutions than the intertidal; the impacts could be major, but limited and short-term; especially on sensitive fish and invertebrate larvae. Effects on the distribution and abundance of nearshore organisms are unknown. The effect on benthic fauna is major but very limited; that on nektonic or free-swimming fauna unknown. As Carkeek is a small facility, the effects of its effluent are assumed not to extend to offshore biota. Commercial and migratory fish do occur inshore, however, and could be subject to minor, limited, short-term impacts from the effluent.

Piper Creek. The creek is not affected in this alternative.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations.

This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use; legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archaeological and historical; health and safety; and aesthetic and nuisance.

Land use. Under Alternative A, the Carkeek Park plant would continue to provide primary treatment; no new land would be used. Some people would say that the wastewater facility conflicts with the park environment, but others that it is well hidden. This impact is considered adverse, minor, long-term, reversible, local, and definite.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. This alternative would not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternative would not meet the objective of 54% of the 370 people interviewed in the Carkeek Park area that PL 92-500 be complied with (HRPI, 1976.)

Regional agency goals are explained in the Regional EIS.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. This alternative would keep the Carkeek Park facility from being further expanded, and thus would preserve picnic areas and the canyon trail. Preserving the picnic areas is considered to be lower priority than installing secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Archaeological and historical. No known archaeological or registered historical sites would be affected by any of the alternatives at Carkeek Park.

Health and safety. There would continue to be health risks associated with the consumption of raw shellfish, because of primary discharges from the Carkeek Park facility.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as improbable as for any other trucks in transit.

Aesthetics and nuisance. Under this alternative, no new nuisances would occur; the existing facility would still be mostly hidden among trees; odors would continue to be emitted at low concentrations. The presence of the facility only bothered 4% of the 370 Carkeek Park area residents interviewed, and it is expected that this trend would continue under this alternative.

Under this alternative, there would be 1.2 sludge trucks per day leaving the Carkeek Park wastewater treatment facility. These must travel on narrow, dangerous roads. The impact of this is adverse, minor, long-term, local, reversible, and definite, if this alternative is implemented in its present form.

Mitigation Measures

Because of the no action definition of Alternative A, no mitigation measures can be proposed.

Unavoidable Adverse Impacts

All adverse impacts under Alternative A would be unavoidable. These would include impacts on water quality, continued use of plant sites in parks or residential areas, and violation of PL 92-500.

ALTERNATIVE B
METRO COMPREHENSIVE PLAN (NO ACTION PURSUANT TO PL 92-500

General Description

In this alternative, the policies and programs of the Metro Comprehensive Plan conceived prior to the enactment of PL 92-500 would be implemented. Metro's primary treatment facilities would be expanded and upgraded to accommodate growth resulting from Metro's present sewer expansion policies.

Collection System and Service Area

The Carkeek Park service area would not change, but its population is projected to increase to 31,000 by 2005; 30,000 would be sewered under Alternative B. The increase in the sewered population tributary to the system would result from filling in partially occupied sewered areas. Per capita wastewater production would also increase from 65 to 75 gallons per day. Thus, the overall effect would be to increase the average dry weather flow to 2.25 mgd (compared to 1.56 mgd under existing conditions).

The peak wet weather flow is expected to increase, however, resulting in more frequent and larger volumes of combined sewer overflows. Except for the North Beach pumping station, future dry and wet weather flows projected for the service area would be within the capacity of both the City of Seattle and Metro transmission systems. The North Beach pumping station, inadequate to handle present wet weather flows, would continue to overflow to Puget Sound. Additional interceptors or pumping stations would not be provided.

Treatment

Primary treatment would continue at Carkeek Park. Since no new structures would be constructed, additional site area would not be required. Under Alternative B, a new chlorine leak detector (estimated to cost $100,000) would be the only additional equipment provided. The plant layout would be as shown in Alternative A, Figure 3-3.

Alternatives and Impacts
Alternative B

Sludge Management

Sludge from Carkeek Park would be digested on-site,then trucked to the Interbay pumping station for transfer to West Point and further treatment.

Impacts

Primary impacts only are discussed here. Secondary impacts are evaluated in the Regional EIS.

Geology, Soils and Topography

Because the Metro Comprehensive Plan (No Action Pursuant to PL 92-500) would include no construction of new facilities, there would be no impacts relative to geology and soils other than a small continued risk of earthquake damage from seismic activity.

Air Quality and Odors

Continued operation of the Carkeek Park plant should have no impact on local atmospheric conditions or air quality. Odors would continue to be an occasional annoyance to users of Carkeek Park. Aerosols and pathogens are not believed to be a problem. The impact on particulates or other air quality constituents from 1.2 sludge haul trups per day is judged to be negligible.

Water Quality Impacts

Under Alternative B, by 2005 the average daily flow to Carkeek Park would increase from 2.2 to 2.9 mgd, and the diurnal peak from 3.4 to 4.6 mgd. In the latter case, and during peak hour flows, the influent flow would also exceed the 3.5 mgd average plant design capacity, resulting in lowered removal efficiency for BOD, suspended solids and other contaminants and higher loadings to the Sound. Such overload would also tax the present disinfection system.

Although there is no evidence of nutrient enrichment in waters near Carkeek Park, the discharge of primary effluent will continue to add nitrogen and phosphorus to Puget Sound. The adverse impacts of the Carkeek Park discharge on Puget Sound water quality are expected to be minor, because the volume is relatively small; limited to waters near Carkeek Park; long-term, because the discharge would continue through the planning period; and, except for the accumulation of toxicants and heavy metals, reversible. The impacts could be somewhat worse, however, if during part of the tidal cycle, currents carried diluted effluent toward shore.

The impact of heavy metals at Carkeek Park is also judged to be minor. The present discharge data (Metropolitan Engineers, 1977) indicates mercury at 0.0007 mg/l in the effluent exceeds the proposed EPA water quality standards for marine life of 0.0001 mg/l (EPA, 1975). The cadmium in Carkeek Park effluent averages 0.004 mg/l and approaches the EPA recommended limit for marine salmonids of 0.005 mg/l. Effective dilution of effluent at the diffuser would bring both of these concentrations to below acceptable levels. If grease buildup blocks enough diffuser ports, the design dilution ratio may not be reached. These metals eventually precipitate as sulfides into the sediment. Once in sulfide form they are not available for biological uptake and concentration.

Biology

Terrestrial habitats. There would be no impact on terrestrial biology under Alternative B as the installation of a chlorine leak detector would require no new land area.

Puget Sound. Under Alternative B, discharge of primary effluent to Puget Sound would continue, with no improvement in disinfection. Bypassing would continue at the North Beach Pump Station.

Effluent on the beach, especially if over-chlorinated, could have a negative but minor impact, limited in extent but continuous on intertidal flora and fauna. Shellfish beds would continue to be impacted by existing microbial quality. Eelgrass beds which are intertidal-subtidal would probably be exposed to effluent at slightly lower dilutions than the intertidal; the impacts could be moderate-to-major, but limited and short-term; especially on sensitive fish and invertebrate larvae. Effects on the distribution and abundance of nearshore organisms are unknown. The effect on benthic fauna is major but very limited; that on nektonic or free-swimming fauna unknown. As Carkeek is a small facility, the effects of its effluent are assumed not to extend to offshore biota. Commercial and migratory fish do occur inshore, however, and could be subject to minor, limited short-term impacts from the effluent. Effects of effluents are considered to be reversible except for metals and toxicants.

Piper Creek. The creek is not affected in this alternative.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations.

This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use; legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archaeological and historical; health and safety; and aesthetics and nuisance.

Land use. Under Alternative B, the Carkeek Park plant would continue to provide primary treatment; no new land would be used. Some would say that the wastewater facility conflicts with the park environment, but it is well hidden. This impact is considered adverse, minor, long-term, reversible, local, and definite.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. This alternative would not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternatives would not meet the objective of 54% of the 370 people interviewed in the Carkeek Park area that PL 92-500 be complied with (HRPI,1976).

Regional agency goals are explained in the Regional EIS.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. This alternative would keep the Carkeek Park facility from being further expanded, and thus would preserve picnic areas and the canyon trail. Preserving the picnic areas is considered to be lower priority than installing secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Archeological and historical. No known archeological or registered historical sites would be affected by any of the alternatives at Carkeek Park.

Health and safety. There would continue to be health risks associated with the consumption of raw shellfish, because of primary discharges from the Carkeek Park facility.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents. There would be even less accident risk after installation of the chlorine leak detector.

The health and safety problems related to sludge transport and disposal would be as improbable as for any other trucks in transit.

Aesthetics and nuisance. Under this alternative, no new nuisances would occur; the existing facility would still be mostly hidden among trees; odors would continue to be emitted at low concentrations. The presence of the facility only bothered 4% of the 370 Carkeek Park area residents interviewed, and it is expected that this trend would continue under this alternative.

Alternative B

Under this alternative, there would be 1.2 sludge trucks per day leaving the Carkeek Park wastewater treatment facility. These must travel on narrow, dangerous roads. The impact of this is adverse, minor, long-term, local, reversible, and definite.

Mitigation Measures

An improved chlorine feed system can be designed to prevent chlorine residuals in the sewage treatment plant effluent from exceeding dangerous levels. This could be achieved by matching chlorine levels to effluent discharge, and/or installing a chlorine contact tank, which would maximize the efficiency of chlorination treatment. Currently chlorine is injected into the effluent flow at a constant rate set manually on a daily basis, regardless of wastewater flow through the treatment facilities. This causes a fluctuating chlorine residual.

Visual nuisance of the wastewater treatment facilities in the park could be mitigated by implementing the landscaping options which would hide the facilities.

Piper Creek, once designated as a "children's fishing area", has low fish populations due to the present treatment plant facilities. The creek now runs under the facility through a culvert installed in the late forties by the Greenwood Avenue Sewer District. High coliform counts in the stream above the plant seem to indicate that water quality is degraded from other sources such as urban runoff and dumping. Rerouting the creek and restoring its banks would allow the creek biota, including fishes, to reestablish themselves. In addition to having a positive effect on biota, the recreational values of the creek would be enhanced.

Sludge trucks in the park are a necessary nuisance with present sludge disposal practices. Installation of dewatering facilities would reduce sludge truck traffic through the reduction of sludge volume.

Grease causes serious operational problems at Carkeek and reduces the effluent quality, through plugging the outfall ports, and the sludge lines, and building upon the walls of the chlorine contact channel. The grease problem could be mitigated through identification and control of the source.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable:

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Pump station overflows. This alternative does not take adequate measures to control overflows; they will still occur in wet weather.

Primary effluent effect on water quality and biota. This alternative does not implement secondary treatment; the minor water degradation of Puget Sound would continue as would effects on biota.

Violation of PL 92-500. Public Law 92-500 requires the installation of secondary treatment. This alternative does not comply.

Land use. Land is required in all alternatives; the question is: where will the imapct occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

O & M and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVES C AND D

General Description

Alternatives C and D, although different at the regional level, would affect Carkeek Park in an equivalent manner by upgrading the plant to enhanced primary treatment. Regional Alternative C (Major Combined Sewer Overflow Control) and Alternative D (Partial Combined Sewer Overflow Control) would reduce combined sewer overflows, but not to a substantial degree for the Carkeek Park service area.

Service Area and Collection System

Under Alternatives C and D, the Carkeek Park Service Area would not change relative to existing conditions. Sewered population would increase to 30,000 by 2005, as in Alternative B. The average dry weather flow would be 2.25 mgd; peak flows to the plant would be 20 mgd. On an annual basis, the average flow would be 3.5 mgd. Sewer system improvements to reduce peak flows to approximately 15 mgd in order to eliminate plant bypassing could be provided under Alternatives C and D.

Treatment Plant

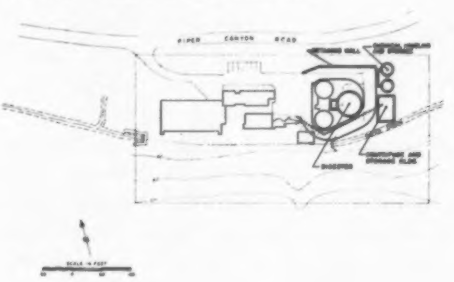
The Carkeek Park plant would be upgraded to enhanced primary treatment by 1985. Addition of chemical coagulants would improve solids and BOD removals. However, the chemicals would be applied only during the summer; primary treatment would continue during the remainder of the year.

Chemical feeding and storage facilities would be provided on the present site as shown in Figure 3-4. Additional site area would not be required. The construction cost for improvements is estimated at $1.5 million.

Under Alternatives C and D, the Carkeek Park effluent would be discharged to Puget Sound through the existing outfall.

Sludge Management

Digested sludge would be dewatered by batch centrifuge


METRO - CARKEEK PARK WASTEWATER TREATMENT PLANT
PIPER CANYON ROAD
RETAINING WALL
DIGESTER
SCALE IN FEET

ENHANCED PRIMARY

Figure 3-4

Carkeek Park Treatment Plant
Layout — — Alternatives C and D

at Carkeek Park to reduce the sludge volume and sludge truck traffic through the park. Because the solids load would increase, a third digester would be added, as shown in Figure 3-4. Treated sludge would be hauled directly to the Cedar Hills landfill and to the Pack Forest experimental recycling center.

Impacts

Primary impacts only are discussed here. Secondary impacts are evaluated in the Regional EIS.

Geology, Soils and Topography

Since Alternatives C (Major Sewer Overflow Control) and D (Partial Service Overflow Control) would involve construction of a new digester, chemical handling and storage facilities, a centrifuge and storage building, and a retaining wall on the site,plus some sewer improvements, the impacts on geology, soils, and topography have been evaluated. However, the area at the plant site that would be used for new facilities has already been cleared and leveled as part of the existing plant pad, so no changes in topography or soil profile would result. The retaining wall appears to serve a screening rather than structural function, which indicates no changes in slope stability are expected. Thus, the only geologic impact at the site would be the continued small risk of earthquake damage. The construction of sewer system improvements could result in temporary adverse impacts on slope stability, but of a minor nature, limited in extent and of short duration.

Air Quality and Odors

The provision of enhanced primary treatment at Carkeek Park would slightly increase the potential for odors in the park. The change in sludge truck traffic would not have a noticeable impact on particulate emissions or other air quality constituents. During construction of the new chemical handling and sludge digester facilities, no air quality impacts from dust are foreseen because the land needed to support this equipment has already been cleared. Thus, no net change in air quality or climate would result at the site. Construction activity along the routes of sewer improvements could temporarily affect air quality to a very limited degree by increases in particulates.

Water Quality Impacts

Alternatives C and D emphasize control of combined sewer overflows, which are not now a major problem at Carkeek Park due to the fact that 90% of the collection system contains separated storm and sanitary sewers. Since engineering studies have indicated that control of excessive infiltration/inflow into the sewerage system would not be economical (Metropolitan Engineers, 1977), the hydraulic overload of the plant and pumping station would continue at Carkeek Park. However, Alternatives C and D would include some sewer system improvements to reduce peak flows at the plant to 15 mgd, thus eliminating plant bypasses. Treatment at these peak flow levels would be marginal during wet weather periods. Overall, the net change in effluent quality due to sewer improvements would be minimal. Residual impacts on water quality are anticipated.

The provision of enhanced primary treatment during the summer would achieve moderate reductions in suspended solids and BOD loads (22% and 21% respectively) to the Sound relative to present conditions. Although the discharge of solids, metals, toxicants and other materials would continue, there would be a net improvement over present conditions. The reduced amount of chlorine needed for disinfection of enhanced primary effluent could produce decreased adverse effects from toxicity and more effective disinfection during summer months also. Some phosphorus removal would occur with the lime addition, but nitrogen would not be affected. Since nitrogen appears to be the limiting nutrient in Puget Sound, phosphorus reduction would not diminish the potential for nutrient enrichment.

Biology

Terrestrial habitats. The construction of chemical handling and storage facilities to the east of the plant under Alternatives C and D would cause a minor, limited, long-term adverse impact to the terrestrial ecology of Carkeek Park by removing a few trees and portions of a grassy area.

Puget Sound. Under Alternatives C and D, the Carkeek Park sewage treatment plant would discharge enhanced primary effluent to Puget Sound in summer, the primary recreation season. Alternatives C and D would also provide for sewer system improvements to reduce peak flows in order to prevent bypassing. Wet weather treatment would be marginal, or primary at best, at these high flow rates. Any existing effects on intertidal organisms from overflows or effluent coming ashore would be somewhat (22%) reduced below baseline conditions, as described under Alternative B. Flows would then be greater than and solids and BOD about the same as 1975 levels. Some potential minor, limited, intermittent but continuing adverse impacts could remain. Effects of nutrients would continue at baseline levels.

One-third less chlorine would be required in summer for disinfecting enhanced primary effluent, but if added at a constant feed rate as now, overchlorination or underchlorination could continue. Nitrates would be unaffected by alum treatment, although 22% of the suspended solids and 21% of the BOD would be removed. In wet weather, almost untreated flows would be discharged, however. Potential intertidal and nearshore impacts could continue as the source of bacteria has not been identified; it cannot be determined whether or not C and D would affect bacterial levels.

Any effects on the benthic communities due to nutrients would be unchanged; these effects due to solids, BOD, metals or toxicants could diminish slightly-to-moderately in a limited area.

Metals in biota near Carkeek were evaluated as part of the PSIS. Plankton at Carkeek contained 100 μg/gdw (100 ppm) of zinc, half as much as at West Point, but five times as much as at Hood Canal, the control area. Copper in plankton at Carkeek was about one-fourth that at Elliott Bay but ten times concentrations in Hood Canal plankton.

Concentrations of lead, copper, cadmium, selenium, in tissues of fishes collected at Carkeek were generally about as high as at West Point. Fish assayed were English sole, Dover sole, and Slender sole.

Lead and mercury in certain intertidal biota at Carkeek were assayed. Plants (algae) tended to concentrate more lead than mercury; while clams and mussels appeared to concentrate more mercury than lead. Levels of both metals in Carkeek plants and animals were similar to those at West Point. All lead values were below the Canadian Food and Drug Directorate value of 2 ppm wet weight. U.S. mercury standards of 0.5 ppm (or 500 grams per billion grams wet weight) were not exceeded.

Piper Creek. With construction of new facilities, eroded materials could deposit in the creek bed, with resulting adverse effects on benthic organisms and the remaining fish and fish eggs. The effect is considered to be minor, limited in extent and short-term .

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use; legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archaeological and historical; health and safety; and aesthetics and nuisance.

Land use. Under Alternatives C and D, the Carkeek Park facility would be slightly expanded to include enhanced primary treatment. All of this expansion would occur within the present security fence, so there is expected to be little new impact on land use; the impact would still be adverse, minor, long-term, reversible, local, and definite.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. These alternatives would not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. These alternatives would not meet the objective of 54% of the 370 people interviewed in the Carkeek area that PL 92-500 be complied with

(HRPI, 1976). This is considered adverse, major, long-term, reversible, regional, and definite.

These alternatives do fulfill the PSCOG goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" when the still-operable Carkeek Park facility is used.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. These alternatives would keep the Carkeek Park facility from being expanded beyond the present security fence, which would preserve picnic and canyon trail areas. The picnic areas are considered as a lower priority than installing secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Archeological and historical. No known archeological or registered historical sites would be affected by any of the alternatives at Carkeek Park.

Health and safety. There may continue to be health risks associated with the consumption of raw shellfish because of continued primary effluent discharge, as is discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

Aesthetics and nuisance. Under these alternatives, no new nuisances would occur; the existing facility would still be mostly hidden among trees; odors would probably only be emitted during wet weather while the Carkeek Park facility is in operation. The presence of the facility only bothered 4% of the 370 Carkeek Park area residents interviewed, and it is expected that this trend would continue under these alternatives.

There would be 0.3 sludge trucks per day leaving the Carkeek Park facility under these alternatives. These would travel narrow, dangerous roads. Only a few of those interviewed were concerned about sludge trucks (HRPI, 1976). Their impact is considered adverse, minor, long-term, reversible, local and definite.

Mitigation Measures

An improved chlorine feed system can be designed to prevent chlorine residuals in the sewage treatment plant effluent from exceeding dangerous levels. This could be achieved by matching chlorine levels to effluent discharge, and/or installing a chlorine contact tanks, which would maximize the efficiency of chlorination treatment. Currently chlorine is injected into the effluent flow at a constant rate set manually on a daily basis, regardless of wastewater flow through the treatment facilities. This causes a fluctuating chlorine residual.

Visual nuisance of the wastewater treatment facilities in the park could be mitigated by implementing the landscaping options which would hide the facilities.

Piper Creek, once designated as a "children's fishing area," has low fish populations due to the present treatment plant facilities. The creek now runs through a culvert under the facility. Rerouting the creek and restoring its banks would allow the creek biota, including fishes, to reestablish themselves. In addition to having a positive effect on biota, the recreational values of the creek would be enhanced.

Wastewater to Puget Sound affects water quality and biota year-round. Therefore, year-round enhanced primary treatment would reduce these effects and allow for more efficient disinfection with less chlorine.

Grease causes serious operational problems at Carkeek and reduces the effluent quality, through plugging the outfall ports, and the sludge lines, and building upon the walls of the chlorine contact channel. The grease problem could be mitigated through identification and control of the source.

Unavoidable Adverse Impacts

Under these alternatives, the following adverse impacts would be unavoidable:

Facilities construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Pump station overflows. These alternatives do not take adequate measures to control overflows; they will still occur in wet weather.

Primary effluent effect on water quality and biota. These alternatives do not implement secondary treatment; the water degradation of Puget Sound would continue as would effects on biota.

Violation of PL 92-500. Public Law 92-500 requires the installation of secondary treatment. These alternatives do not comply.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

O & M and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVES E, F AND G

General Description

Regional Alternatives E, F, and G would provide secondary treatment for various Metro treatment plants. They would affect Carkeek Park equally by transferring its dry weather flows for treatment at West Point (Alternative E and F) or Interbay (Alternative G). Wet weather flows would receive primary treatment at Carkeek Park, leaving the option for eventual phase out of the plant.

Service Area and Collection System

The Carkeek Park service area would remain as in Alternative B. However, only wet weather flows would be transferred to the plant for treatment beginning in 1985.

Dry weather flows from the 30,000 sewered population would be transferred to West Point for secondary treatment beginning in 1985 under Alternatives E and F and to Interbay for secondary treatment under Alternative G.

In order to achieve eventual abandonment of the Carkeek Park plant, several modifications to the collection system would be necessary.

The proposed work under these alternatives would be accomplished in two phases. The first phase would require the enlargement of the North Beach pumping station to accommodate the dry weather flow from the Carkeek Park treatment plant drainage area as well as the North Beach pumping station drainage area. The Carkeek Park connection to Golden Gardens Park would pass along the railroad track right-of-way which skirts the Puget Sound shoreline. South of Golden Gardens Park, the connection would continue underneath Seaview Avenue, then under Shilshole Avenue, through an inverted siphon under Salmon Bay, to the north interceptor which feeds the West Point or Interbay plant.

During this phase the Carkeek Park treatment plant would be used as a wet weather treatment plant to treat the flow in excess of the dry weather flow, diverted to the North Beach pumping station. The excess wet weather flow would receive primary treatment and be discharged by the existing outfall to Puget Sound. A regulator bypass as well as modifications to the outfall system would be required, as shown on Figure 3-5.

The second phase could be eventual abandonment of the Carkeek Park plant, as its functions would be replaced. Following the completion of the City of Seattle sewer system rehabilitation program to reduce infiltration and inflow (probably by 1995), the Carkeek Park plant could be removed from service. The regulator station would remain. Combined sewer overflow would be completely eliminated at the plant as well as the North Beach pumping station. The Carkeek Park wastewater flows will be treated at West Point or Interbay.

Treatment

Until 1985, the Carkeek Park plant would provide primary treatment to wet and dry weather flows, as in Alternative B. Wet weather flows only, to 20 mgd peaks, would receive primary treatment but not disinfection until the plant phaseout or abandonment.

Sludge

Primary sludge would be treated on-site until 1985 by anaerobic digestion and trucked to the Interbay pumping station for further treatment at West Point (Alternatives E and F) or Interbay (Alternative G).

Impacts

Primary impacts only are discussed here. Secondary impacts are evaluated in the Regional EIS.

Geology, Soils and Topography

Under Phase I plant alternatives, the existing facilities would remain at the Carkeek Park site. The only potential for new impacts on geology, topography or soils would result from constructing a connecting sewer to the North Beach pumping station, a connection to an existing sewer to accommodate wet weather flows, and a regulator facility on the treatment plant site. Minor adverse changes in slope stability,

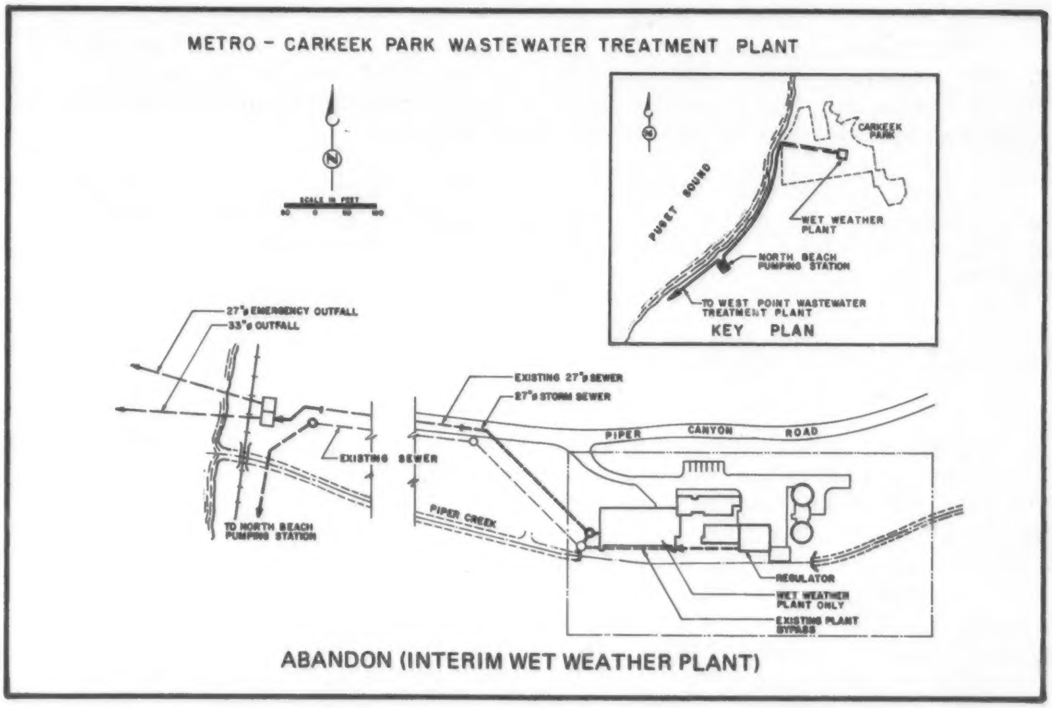

METRO - CARKEEK PARK WASTEWATER TREATMENT PLANT
SCALE IN FEET
50 0 50 100
CARKEEK PARK
PUGET SOUND
WET WEATHER PLANT
NORTH BEACH PUMPING STATION
TO WEST POINT WASTEWATER TREATMENT PLANT
KEY PLAN
27"ø EMERGENCY OUTFALL
33"ø OUTFALL
EXISTING SEWER
TO NORTH BEACH PUMPING STATION
EXISTING 27"ø SEWER
27"ø STORM SEWER
PIPER CANYON ROAD
PIPER CREEK
REGULATOR
WET WEATHER PLANT ONLY
EXISTING PLANT BYPASS
ABANDON (INTERIM WET WEATHER PLANT)

Figure 3-5

Carkeek Park — — Alternatives E, F, and G erosion, and deposition could occur temporarily during construction of these facilities. Since the main plant would remain on the site, the small earthquake-related risk would remain.

Phase I would also include the construction of the Carkeek-West Point Interceptor, which would transfer Carkeek dry weather flows to West Point in Phase II. The impacts of the portion of this pipe within the Carkeek service area would be slight. The pipe would be laid along railroad tracks or under streets. The soils in these areas have already been modified by construction and utility lines are already present.

In Phase I, existing Carkeek facilities would operate in wet weather only and no new structures would be built. The effects of this phase of facility planning on geology, topography and soils would be negligible.

Phase III would be eventual abandonment of Carkeek at some unspecified date. No earth impacts are anticipated. In Phases I and II, minor earthquake damage risk would continue.

Air Quality and Odors

Conversion of the Carkeek Park plant to a wet weather facility would eliminate the potential for odors affecting the park during the dry season (May-October). Periodic removal of solids deposited during wet weather flow periods would require some sludge truck traffic, but not of a magnitude to create air quality impacts. If sludge is not removed, solid material deposited at Carkeek Park could go spetic and generate nuisance odors, but good operating procedures are assured, and no odor related impacts are expected. Construction of new connection sewers may cause minor increases in particulates during a brief period.

Water Quality

During the second phase of Alternatives E, F, and G, the dry weather flow from the Carkeek Park treatment plant drainage area and from the North Beach pumping station drainage area would be pumped to West Point or Golf Park/Commodore Way for secondary treatment. Thus, the wastewater from Carkeek Park would produce no impact on Puget Sound water quality offshore from Carkeek Park during dry weather. Peak hour wet involved. Bacterial criteria for bathing may not be further exceeded in summer. Chlorine toxicity risk would be eliminated year-round.

Effects of pump station overflows in the form of pathogens, solids, BOD, nutrients, metals, toxicants and grease would be eliminated on the beach where they occur. The probable benefit would be minor, and limited in extent but of long duration.

Impacts on the bottom communities suggested in the PSIS would probably decline with the drecreased loads of nutrients, BOD, solids, metals and toxicants of Phase I. Fishes attracted to the pipe itself and/or to life attached to the pipe would probably remain, so the magnitude of changes due to reduction of effluent cannot be predicted. Any impacts on sensitive eelgrass beds from metals, toxicants and grease would probably be reduced, however, with the cessation of summer flows.

An interceptor for transferring Carkeek dry weather flows to West Point (E, F) or to Interbay/Commodore Way (G) would be constructed far enough inland so that no impact is expected on Puget Sound biota during construction or operation.

Piper Creek. No impacts are expected as there would be no construction on the site. Optional landscaping and architectural changes not costed into these alternatives could provide benefits to aquatic biota if the creek is rerouted around the structures and restored.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use, legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archeological and historical; health and safety; and aesthetics and nuisance.

Land use. Under Alternatives E, F, and G, the Carkeek Park plant would provide primary treatment only for wet weather flows, beginning in 1985 until the projected phase-out date in 1995; dry weather flows would be pumped through a proposed Carkeek Park Connection. Under Alternatives E and F, these flows would go to Interbay. Construction of the segments of this connection within 200 feet of shore would require Seattle Shorelines Management Plan permit. The impact of this land use would be adverse, minor, long-term, local, and definite.

This would also require the expansion of the North Beach pumping station. This expansion could occur upon land which is already owned by Metro, and could probably be built underground so as not to block views of the beach from the houses above. Since this construction would not be within 200 feet of the shoreline, it would not require a Seattle Shorelines Management Plan permit.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. Alternatives E, F and G would provide only primary treatment in wet weather to combined sewage and storm flows at Carkeek Park, which would not be in strict compliance with PL 92-500 secondary treatment requirements for municipal wastewater.

Agency and neighborhood goals. These alternatives attempt to fulfill the priorities set by PSCOG that "natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice" by reducing the use of the Carkeek Park facility, which is on prime land. However, that objective is not completely met, because there would still be a wet weather wastewater treatment facility at Carkeek Park.

These alternatives do not fulfill the PSCOG goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" when the still-operable Carkeek Park facility is used only for wet weather flow.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. These alternatives would keep the Carkeek Park facility from being further expanded, which would preserve picnic and canyon trail areas. Preserving the picnic areas is considered to be lower priority than installing secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Archeological and historical. No known archeological or registered historical sites would be affected by any of the alternatives at Carkeek Park.

Health and safety. There may continue to be health risks associated with the consumption of raw shellfish because during wet weather months, primary effluent would still be discharged, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as improbable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedure there should be a limited chance of accidents.

Aesthetics and nuisance. Under these alternatives, no new nuisances would occur; the existing facility would still be mostly hidden among trees; odors would probably only be emitted during wet weather while the Carkeek Park facility is in operation. The presence of the facility only bothered 4% of the 370 Carkeek Park area residents interviewed, and it is expected that this trend would continued under these alternatives.

Construction of the Carkeek Park Connection and North Beach pump station would cause temporary nuisances. The section of pipe installed along the railroad would cause only slight annoyance. The railroad is already an aesthetic nuisance, and pipe construction would not be conspicuous in this setting nor interfere with the activities of many people. Construction would cause traffic congestion and noise along Seaview and Shillshole roads. These impacts would be minor, short-term, reversible, and local.

Mitigation Measures

Visual and recreational benefits would accrue from dismantling the existing treatment plant structures when the plant is abandoned, extending the picnic area and restoring the continuity of the wooded character of the park.

Piper Creek, once designated as a "children's fishing area," has low fish populations due to the present treatment plant facilities. The creek now runs under the facility through a culvert installed in the late forties by the Greenwood Avenue Sewer district. High coliform counts in the stream above the plant seem to indicate that water quality is degraded from other sources such as urban runoff or dumping. Rerouting the creek and restoring its banks would allow the creek biota, including fishes, to reestablish themselves. In addition to having a positive effect on biota, the recreational values of the creek would be enhanced.

The Carkeek-West Point interceptor has the potential for serious, long-term environmental damage in its disruption of tidelands, and shorelines, in the Carkeek service area. To mitigate these effects, alternative routes inland and away from shores could be investigated.

Grease causes serious operational problems at Carkeek and reduces the effluent quality, through plugging the outfall ports and the sludge lines, and building upon the walls of the chlorine contact channel. The grease problem could be mitigated through identification and control of the source.

Unavoidable Adverse Impacts

Under these alternatives, the following adverse impacts would be unavoidable:

Sludge trucking. Under current practices of disposing of sludge at remote sanitary landfill sites, there will necessarily be sludge trucking until Carkeek flows are transferred in 1985.

Primary effluent effect on water quality and biota. These alternatives do not implement secondary treatment; the water degradation of Puget Sound would continue as would effects on biota until 1985.

Violation of PL 92-500. Public Law 92-500 requires the installation of secondary treatment. These alternatives do not comply, until 1985.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

O & M and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditure. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

Interceptor construction. Extensive disruption will occur wherever lines are laid.

ALTERNATIVE H

General Description

This alternative addresses the decentralization issue on the regional level with emphasis on effluent and sludge reclamation. The Carkeek Park treatment plant would be upgraded to secondary treatment.

Service Area and Collection System

No changes would be made in the Carkeek Park service area.

Major sewer additions to the collection system would not be required to serve population growth. Future addition would mainly be limited to lateral sewers. The excessive inflow problem would be corrected, and the peak wet weather flow would be reduced to 12.5 mgd, since this would be cost effective with secondary treatment.

Treatment Plant

The present treatment plant would be upgraded to secondary treatment to provide 85 percent removal of BOD and suspended solids. The processes would include primary treatment, secondary treatment by air activated sludge, and disinfection of the effluent before discharge to Puget Sound. Carkeek Park facilities upgrading would cost $8,300,000.

The secondary facilities, shown in Figure 3-6, would require expansion of the present plant site to 4.0 acres. The Draft Facility Plan shows the 1.1 acre expansion in an existing picnic area. However, expansion toward the canyon trail area is another option.

Sludge

Sludge would be treated by anaerobic digestion, which would require constructing a third digester for the additional solids load from secondary treatment. New dewatering facilities would be provided on-site to reduce sludge volume and sludge truck traffic. Treated sludge would be hauled to Cedar Hills landfill.

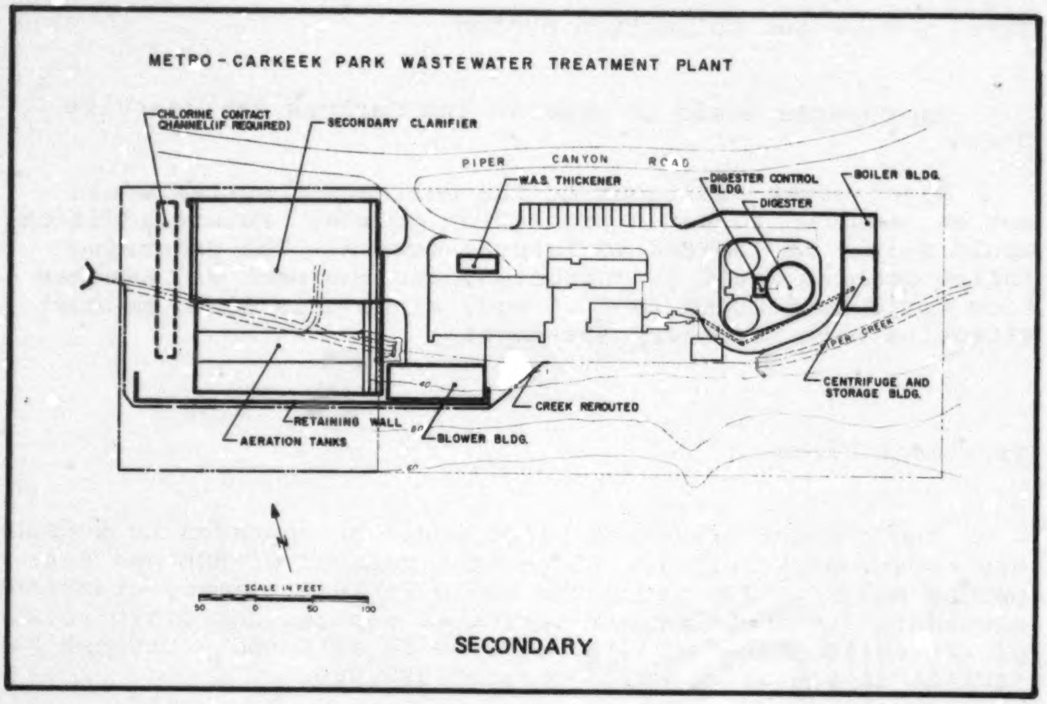

METPO - CARKEEK PARK WASTEWATER TREATMENT PLANT
CHLORINE CONTACT CHANNEL(IF REQUIRED)
SECONDARY CLARIFIER
PIPER CANYON ROAD
W.A.S. THICKENER
DIGESTER CONTROL BLDG.
DIGESTER
BOILER BLDG.
PIPER CREEK
CENTRIFUGE AND STORAGE BLDG.
CREEK REROUTED
RETAINING WALL
AERATION TANKS
BLOWER BLDG.
40
80
60
N
SCALE IN FEET
50
0
50
100
SECONDARY

Figure 3-6

Carkeek Park Treatment Plant
Layout -- Alternative H

Impacts

Primary impacts only are discussed here. Secondary impacts are analyzed in the Regional EIS.

Geology, Soils and Topography

Provision of secondary treatment at Carkeek Park would require an additional 1.1 acres of site development, but no shoreline fill. The new facilities would include aeration tanks, secondary clarifier, blower building, waste activated sludge thickener, digester, centrifuge and storage building, and a boiler building. Rerouting Piper Creek would also be necessary. Permanent alteration to the valley floor, removal of surface fill unsuited for structural support, excavation, dewatering below groundwater elevation, and construction on probably unstable creek slopes are expected to cause minor-to-moderate adverse impacts on slopes, erosion, topography, and construction waste disposal sites. The potential for earthquake damage would remain a minor risk at the site.

Air Quality and Odors

Upgrading the Carkeek Park plant to secondary treatment would increase the potential for odors escaping to the surrounding area. Because secondary treatment plants are larger and more complex than primary plants, expose more water surface area to the air and subject the water to more perturbation, there is a greater likelihood for odors being released into the surrounding neighborhood from secondary treatment plants. Treatment plant odors can be controlled in part by covering secondary clarifiers, as is discussed in the section on mitigation measures. The release of odors would cause a minor impact over a limited area. During construction, temporary increases in particulates are expected. Any increases in sludge truck traffic are not projected to produce a noticeable impact on air quality.

Water Quality Impacts

Under Alternative H, secondary treatment would be provided at Carkeek Park. Excessive inflows would be corrected and the peak wet weather flow would be reduced to 12.5 mgd, eliminating plant bypassing. Pump station and other overflows from the Carkeek Park service area would be completely eliminated.

The use of secondary treatment would produce little change in nutrient loadings to Puget Sound, which presently produce very minor impacts. Improved suspended solids removal may remove occasional solids loads to beaches due to effluent washup on beaches during certain portions of the tidal cycle. The more effective disinfection by secondary treatment could reduce the adverse microbiological conditions along the beach to a minor impact. Residual impacts from heavy metals could remain, but would be less following secondary treatment than under other treatment alternatives for dry weather flow on an average basis. Similarly, toxicants may be less with secondary treatment, but some residual adverse impacts could remain. Flood hazard at the site would continue as a remote possibility.

Biology

Terrestrial biology. The installation of secondary treatment facilities would entail the removal of considerable areas of forest and grassland from Carkeek Park. This would reduce the suitable habitat available for forest birds and mammals, causing displacement and increased competition for ecological niches in the rest of the park. This is judged to be a minor, limited, but long-term and irreversible adverse impact.

Puget Sound. Alternative H provides secondary treatment at the existing site, and pump station overflows would be eliminated. Effluent flows and, therefore, nutrient loads, would continue at baseline (B) levels. BOD and solids loads, however, would be reduced 81% and 75%, respectively. As a result, metals and toxicants loads would probably be similarly reduced.

It is assumed that Carkeek effluent comes ashore during part of the tidal cycle. Any effects on the intertidal from nutrients would continue at baseline levels. Any effects of BOD, solids, metals, and toxicants could be significantly reduced. No effects have been clearly demonstrated to date, however, so the potential improvements due to H are considered to be minor, limited, and of long duration for metals and toxicants, the levels of which are unknown in Carkeek effluent.

Secondary treatment requires half the chlorine to achieve the same level of bacterial kill as in primary. If present chlorine practices continue, in which the injection rate is manually adjusted on a daily basis, the chlorine residual will continue to fluctuate with hourly flow variations, such that overchlorination and underchlorination would continue to be real possibilities.

Pathogen imputs from pump station overflows would be eliminated. Pathogens in underchlorinated effluents could continue to reach beach areas, but in unknown quantities. State median fecal and total coliform standards for commercial shellfish waters are exceeded at Carkeek beaches; the source(s) of the bacteria has not been identified. Piper Creek may well be contributing a substantial portion of the pathogens found.

Effects of Carkeek effluent on benthic communities due to nutrients would continue under Alternative H. Effects due to solids, BOD, metals, and toxicants would, probably, decrease in magnitude with major removals of these parameters from effluent due to secondary treatment.

Nearshore free-swimming life would, probably, continue to be attracted by the outfall pipe and the life attached to it. Fishes or other organisms attracted by the plume and/or the changes in benthic prey species due to the outfall could also remain, even though the amount of organic solids and fine sediments deposited would decrease. The possibility of exposure to high chlorine residuals would continue.

Piper Creek. Construction could cause major adverse impacts, limited in extent and of moderate-to-long duration in the form of turbidity in the creek and changes in the character of the creek bed. Particles could bury small benthic organisms, clog the remaining fishes' gills, and prevent fish eggs from being properly oxygenated. The effect is judged to be adverse, moderate, limited in extent, and of long duration. If the fish populations are further reduced below some threshold number, they may not survive. Restocking would be successful only after the stream has recovered enough to provide suitable habitat again. At the same time, rerouting some of the creek and installing a waterfall could improve it to a moderate, limited but long-term extent. These actions are optional, however, and not costed into the facilities planning alternative.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use, legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archaeological and historical; health and safety; and aesthetics and nuisance.

Land use. Under Alternative H, the Carkeek Park facility would be expanded to secondary treatment, which would require the acquisition of new land which is currently used for picnicking, and would cause Piper's Creek to be routed under the air-activated sludge unit, and the path to be routed around this unit. The impact of this land usage would be adverse, moderate, long-term, irreversible, local, and probable.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. This alternative would fulfill the requirements of PL 92-500.

There is a question of whether Metro could acquire more of the Carkeek Park land. This land may be legally restricted to park use because of its "gift" status, but condemnation proceedings are not precluded.

Agency and neighborhood goals. Upgrading or expanding the wastewater treatment plant was favored by 54% of the 370 Carkeek Park area residents interviewed. This alternative would meet that goal.

This alternative fulfills the PSCOG goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" when the still-operable Carkeek Park facility is expanded for secondary treatment.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. This alternative would further expand the Carkeek Park facility which would use picnic and canyon trail areas. Preserving the picnic areas is considered to be a lower priority than installing secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Archeological and historical. No known archeological or registered historical sites would be affected by any of the alternatives at Carkeek Park.

Health and safety. There may be fewer health risks associated with the consumption of raw shellfish because secondary rather than primary effluent is discharged, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as improbable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there should be a limited chance of accidents.

Aesthetics and nuisance. Expansion of the wastewater facility would cause new nuisances to the Carkeek Park area: odors may be greater because of more contact with ambient air; there would be additional encroachment upon one of the few flat areas in Carkeek Park. These impacts are considered adverse, minor, long-term, irreversible, local, and definite.

There would be 0.3 sludge trucks per day leaving the Carkeek Park facility under this alternative. These would travel narrow, dangerous roads. Only a few of those interviewed were concerned about sludge trucks (HRPI, 1976). Their impact is considered adverse, minor, long-term, reversible, local, and definite.

Mitigation Measures

Visual nuisance of the wastewater treatment facilities in the park could be mitigated by implementing the landscaping options which would hide the facilities.

The increased odor potential associated with secondary treatment facilities is the result of more water surface exposed to the air. This can be mitigated through covering the secondary clarifiers.

Grease causes serious operational problems at Carkeek and reduces the effluent quality, through plugging the outfall ports and the sludge lines, and building upon the walls of the chlorine contact channel. The grease problem could be mitigated through identification and control of the source.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Facilities construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

O & M and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

SUMMARY OF IMPACTS

Geology, Soils and Topography

Alternatives E, F and G, which include the construction of the Carkeek-Interbay/West Point interceptor, would have minor, short-term adverse impacts on about half the shoreline bordering the Carkeek service area. Impacts on the plant site in these alternatives would be negligible; the construction of small connection plus a regulator facility on the treatment plant site would have minor temporary impacts.

Alternative H implements secondary treatment at Carkeek, requiring the most construction and land alteration at Carkeek Park itself. Negative impacts on soils, slope stability and erosion are expected to be minor-to-moderate, limited in extent (in the Park) of long duration and generally irreversible.

Most facilities in Alternatives C and D would be constructed on the existing plant site which has already been cleared and leveled, so no changes in topography or soil profile would result. No changes in slope stability are expected. Construction of minor sewer system improvements are expected to have minor temporary adverse effects on slope stability in limited areas.

Alternatives A and B would have no effects on geology, topography or soils. A small continued risk of earthquake damage from seismic activity would continue in all alternatives.

Air Quality and Odors

None of the alternatives are expected to cause noticeable impacts on air quality. During construction, Alternatives C through H could temporarily cause minor increases in particulate levels nearby. Any impacts on air quality from sludge truck traffic in the various alternatives would be negligible. Alternatives A through D would continue the present minor odor problems in Carkeek Park. Alternatives E-G, which would reduce the Carkeek Park plant to a wet weather facility in 1985, would eliminate the potential for odor problems during the dry season. Operation of the secondary treatment plant of Alternative H would increase the potential for odors escaping into Carkeek Park.

Water Quality Impacts

None of the alternatives are expected to produce major impacts on water quality offshore from Carkeek Park. This results primarily from several factors, namely the predominant circulation patterns offshore, the fact that most storm and sanitary sewers in the Carkeek Park Service area are already separated, and the relatively small size of the Carkeek Park discharge and overflows to Puget Sound.

Under Alternatives A and B, which generally represent continuation of existing discharge conditions, some minor adverse impacts would continue that are related to discharge of nutrients, suspended solids, heavy metals, pathogens, and toxicants to the local waters on a long-term basis. Although minor and subtle, these impacts would be more substantial than other alternatives for Carkeek Park.

Advanced primary treatment, under Alternatives C and D, could be expected to achieve some local water quality improvement relative to existing conditions. However, residual toxic materials, nutrients and solids would still be discharged to the Sound and could produce limited adverse impacts offshore. Nearshore impacts from this discharge would be negligible except during slack tide. In addition, the enhanced primary treatment with chemical precipitation for solids and other contaminant removal would only be operated during the summer months. Impacts from the more conventional primary treatment would thus continue as under existing conditions during the remainder of the year.

Alternative H, secondary treatment, would produce a substantial additional increment of water quality improvement relative to Alternatives C and D (enhanced primary) due to the use of efficient year-round reductions in suspended solids and metals discharge loads, and potential reductions in toxicants.

Alternatives E, F and G would result in substantial improvement to water quality offshore from Carkeek Park, since dry weather flows of sewage would be transferred to West Point (E, F) or Interbay (G). Only wet weather storm flows would be discharged through the Carkeek Park outfall; they would be expected to produce only very minor and limited impacts on Puget Sound water quality. Remaining minor adverse impacts on water quality would cease after 1995 if the Carkeek Park plant is abandoned as projected.

As the sources of bacteria have not been identified, whether or not any of the alternatives would affect coliform levels in nearshore waters cannot be determined.

Alternatives and Impacts
Summary

Biology

Terrestrial biology. Alternatives A, B, E, F and G would cause no impact on the terrestrial ecology of Carkeek Park. There would be a slight reduction of grassland habitat under Alternatives C and D. Alternatives H would reduce forest and grassland areas of the park.

Puget Sound. The biologic communities under consideration were those along beaches and in Puget Sound waters off Carkeek Park. Intertidal, benthic and free-swimming biota were evaluated with respect to the effects of year-round chlorinated primary, winter unchlorinated enhanced primary, and secondary effluents and pumping station overflows.

Chlorination facilities would be improved only under Alternative H. In Alternatives E, F and G, however, dry weather flows would go to West Point (E, F) or Interbay (G) and wet weather flows would be unchlorinated. Overchlorination probably occurs regularly in the morning hours, resulting in toxic chlorine residuals. During wet weather the size of the chlorine feeding equipment is not adequate for the higher flows reaching the facility, such that little or no disinfecting effect occurs. Thus the high fecal coliform counts nearshore may be from Carkeek effluent. Other suggested sources of bacteria are Piper Creek and pump station overflows. Toxic effects of effluent in the field have not been examined.

Under C and D, and H, solids would be reduced, allowing for more efficient chlorination of dry weather flows. Wet weather flows could still exceed disinfection capacity, however. Shellfish on Carkeek beaches could continue to pose a potential health risk as waters could continue to exceed state fecal coliform standards for commerical shellfish and, occasionally, bathing standards.

Alternatives E, F and G, in allowing for eventual elimination of all flows from Carkeek and pump station overflows, would benefit Puget Sound benthic and free-swimming biota in the long run. Fecal coliforms would probably be reduced and BOD, solids,metals, toxicants, nutrients loads eliminated. Free-swimming organisms attracted to the outfall pipe and/or the life attached to it would probably remain. Effects of the effluent on bottom communities would begin to decline, but the effects would continue for a long time, as they have at other formerly used outfalls in the study area.

Alternatives and Impacts
Summary

Alternative H would continue year-round effluent discharge, but installation of secondary treatment would reduce BOD and solids loads by 81 and 75%, respectively. Nutrient loads would continue at baseline levels, and any effects of effluent nutrients would similarly continue. Those effects associated with BOD, solids or other parameters would be substantially reduced. Organisms attracted to the pipe and/or attached life would remain. Effects on the bottom community and those fish attracted to it would begin to decline slowly.

Under C and D, nutrients effects would continue at baseline levels. Solids and BOD would be reduced 21-22%. The effect observed on biota would be positive but minor.

Pump station overflows, whose quality and frequency and impacts are unknown, are considered to have moderate adverse impacts, limited in extent on the beach, but of long duration and irreversible for metals and toxicants.

Piper Creek. The creek was evaluated with respect to effects of sediment deposition and turbidity on creek organisms. The amount of construction required under Alternative H could cause extensive deposition, and more of the creek would be covered than at present. The adverse effects on the remaining fish and other stream biota would be moderate-to-severe, limited in extent, but of long duration. Any restocking efforts would be unsuccessful until the streambed character restores itself.

The stream runs under the facility and would continue to do so under the alternatives as planned. Optional measures not costed into the alternatives could restore the creek by rerouting it beside the facility (except in H), probably with return of fish populations.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the

Carkeek Park site are discussed and evaluated only in the Regional EIS. These include such topics as employment and costs, and many of the legal considerations. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Topics described in this volume include: land use; legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archaeological and historical; health and safety; and aesthetic and nuisance.

Land Use

Under Alternatives A, B, C, D, E, F and G, there would be little difference in the land used at the Carkeek Park facility. Under Alternatives A and B, the facility would remain as it presently is. Under Alternatives C and D, there would be a slight addition for advanced primary treatment, but this would occur within the confines of the current security fence; under Alternatives E, F and G, the Carkeek Park facility would only be used during wet weather flows; however, it would still be present year-round, until approximately 1995. Some persons say that the wastewater facility conflicts with the park environment, but others that it is well hidden. This impact is considered adverse, minor, long-term, reversible, local, and definite.

Under Alternative H, the Carkeek Park facility would be expanded to secondary treatment, which would require the acquisition of new land which is currently used for picnicking. Piper's Creek would be routed under the air-activated sludge unit, and Piper's Creek path would be routed around this unit. The impact of this land usage would be adverse, moderate, long-term, irreversible, local, and probable.

Under Alternatives E and F, dry weather flows would be pumped through a proposed Carkeek Park Connection to West Point; under Alternative G, the connection would be to Interbay. The impact of this land use would be adverse, minor, local, definite; and last only for the duration of construction, since this pipe would be underground. Parts of this construction, if within 200 feet of shore, would require a Seattle Shorelines Management Plan permit.

Alternatives E, F and G would also require the expansion of the North Beach pumping station. This expansion could occur upon land which is already owned by Metro, and could probably be built underground so as not to block views of the beach from the houses above. Since this construction would not be within 200 feet of the shoreline, it would not require a Seattle Shorelines Management Plan permit.

Legal and Institutional

Many of the legal issues are developed in the Regional EIS. Alternative H would fulfill the requirements of PL 92-500; Alternatives A, B, C and D would not. Alternatives E, F and G would provide only primary treatment in wet weather to combined sewage and stormflows at Carkeek Park after 1985, which would not be in strict compliance with PL 92-500 secondary treatment requirements for municipal wastes. Once Carkeek is abandoned, E, F and G would comply.

If Alternative H is adopted, there is a question of whether Metro could acquire more of the Carkeek Park land. Legally, this land may be restricted to park use, because of its "gift" status. However, condemnation procedures may still be possible.

Agency and Neighborhood Goals

Compliance with PL 92-500 was favored by 54% of the 370 Carkeek Park area residents interviewed, even if it required upgrading or expanding the wastewater treatment plant. Alternatives E, F, G and H would at least in part meet this goal; Alternatives A, B, C and D would not meet this goal. Although compliance with federal regulations was the first priority of Carkeek Park area residents, they also preferred not to have the Carkeek Park facility expanded, and they wanted it removed if this was economically feasible. Under none of the alternatives would the facility be removed before about 1995; under Alternative H, it would be expanded.

Alternative H fulfills the PSCOG goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" when the still-operable Carkeek Park facility is developed into secondary treatment.

Under Alternatives E, F and G, with the Carkeek Park facility only used during wet weather flows, this objective is not met.

Alternatives E, F and G attempt to fulfill the priorities set by PSCOG that "natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice" by reducport and disposal would be as improbable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there would be a limited chance of accidents. Construction in the Carkeek Park service area would occur under Alternatives C, D, E, F, G and H.

Aesthetics and Nuisance

Under Alternatives A, B, C, D, E, F and G, no new nuisances would occur in Carkeek Park; the existing facility would still be mostly hidden among trees; odors would probably still be emitted occasionally. The presence of the facility only bothered 4% of the 370 Carkeek Park area residents interviewed, and some visitors are not aware of the facility's presence. It is expected that the facility's non-interference would continue under these alternatives.

Expansion of the wastewater facility, under Alternative H, would cause new nuisances to the Carkeek Park area: odors may be greater because of more contact with ambient air; there would be additional encroachment upon one of the few flat areas in Carkeek Park. These impacts are considered adverse, minor, long-term, irreversible, local, and probable.

Table 3-2 indicates the number of sludge trucks per day leaving the Carkeek Park facility for the alternatives. These would travel narrow winding roads. Only a few of those interviewed were concerned about sludge trucks (HRPI, 1976). Their impact is considered adverse, minor, long-term, reversible, local and definite.

TABLE 3-2

Sludge Trucking at Carkeek Park, in Trips/Day

A	B	C	D	E*	F*	G*	H
1.2	1.2	0.3	0.3	0	0	0	0.3

* after 1985

Under Alternatives E, F and G, construction of the Carkeek Park Connection and North Beach pump station would ing the use of the Carkeek Park facility, which is on prime park land. However, that objective is not completely met, because there would still be a wet weather wastewater treatment facility at Carkeek Park. Actually, a casual visitor would not be able to quickly determine whether the Carkeek Park facility is in operation; its presence is what would cause the major aesthetic impact.

Regional agency goals are explained in the Regional EIS.

Employment and Costs

Employment and cost considerations are developed in the Regional EIS.

Social, Recreational, and Cultural

Alternatives A, B, C, D, E, F and G would keep the Carkeek Park facility from being further expanded beyond its present security fence, which would preserve picnic areas and the canyon trail. Preserving the picnic areas is considered to be a lower priority than implementation of secondary treatment by most Carkeek Park area residents, as indicated in Chapter II.

Alternative H would expand into this picnic area, and would cause the Piper Creek trail to be rerouted. This impact is considered adverse, minor, long-term, reversible, local, and probable.

Health and Safety

Under Alternative H, there may be fewer health risks associated with the consumption of raw shellfish because secondary rather than primary effluent is discharged, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment faciliity uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transcause a nuisance during construction, but this would be minor, short-term, reversible and local.

CHAPTER IV

CITIZEN AND AGENCY INVOLVEMENT

Involvement of citizens and agencies regarding the facility plan and EIS for Carkeek Park has consisted of information group sessions, information meetings, and community meetings.

During the spring of 1976, Metro's socio-economic consultant, Human Resources Planning Institute (HRPI), contacted interested citizens and groups in the Carkeek Park area to determine local wastewater treatment concerns and issues. Following initial HRPI contacts, nine citizens attended an informal group session and eight were present at an information meeting.

The first community meeting for the Carkeek Park area was held at the Broadview Community Church on June 3, 1976. Present were fifteen citizens plus representatives of Metro Council, Metro staff, and consultants. The panel discussed the background of PL 92-500, the Metro strategy, alternatives, combined sewer overflows, socio-economic considerations, and design constraints. One citizen raised issues concerning the Metro strategy and its relation to PL 92-500, but the remaining persons attending the meeting did not comment. Based on this first meeting, Metro did not have an indication of citizen priorities for the Carkeek Park plant, but planned to pursue additional contacts in the area. A summary of the meeting is available on request from Metro.

The second community meeting for the Carkeek Park area was a joint meeting for Richmond Beach and Carkeek Park Treatment plants, held on November 15, 1976 at the Shoreline Community College. Attending were thirty-six citizens plus representatives of Metro Council, Metro staff, and consultants. The panel presented main planning alternatives ("no action," "legal", and "goal") and issues, architectural alternatives, and results of a social impact survey.

Among the citizens attending, the present condition and future of the Carkeek Park treatment plant were the major

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concern, but discussion also considered system-wide or regional planning questions. The issues raised included odor (problems from plant, manholes, Piper Creek and/or dumping ground), system planning (service areas, equity, sludge treatment location, trade-offs of Carkeek Park versus West Point expansion, abandonment of Carkeek Park and/or Alki, number of alternatives, consideration of illegal alternatives, decentralization), plant expansion (canyon versus picnic area, legal land use restrictions, geologic stability, sludge truck traffic), combined sewer overflows (incomplete problem solution under Forward Thrust program), rates (relative rates for different users, equity, rate structure), and water quality (possible long-term effects on Puget Sound). Metro prepared a meeting summary and written follow-up on the odor problem.

On June 8, 1977 the participating agencies sponsored a community workshop for input of citizen concerns into the Draft EIS. Five citizens from the Carkeek Park area attended the site-specific workshop for Carkeek Park and Richmond Beach. Many of the concerns expressed previously were interrelated. A summary of main issues indicated by those attending includes: (1) The EIS should study the impacts of expanding the North Beach pumping station; (2) The effects of plant expansion on Carkeek Park were of concern; (3) Odor would be a concern with plant expansion; and (4) phase-out of Carkeek Park would be favored. The group's priority on issues was preventing plant expansion, then making Puget Sound cleaner, and finally maximizing energy and revenue production from wastewater treatment residuals. If the plant were expanded, this group wanted to protect the picnic area, protect the trail, cover the secondary clarifiers, and maintain the park character as natural as possible. As a group, those attending the workshop had different priorities than an earlier random sample of 370 persons in the Carkeek Park service area; the larger group favored improving water quality and was less concerned about the effects of treatment alternatives on Carkeek Park.

Public hearings and/or workshops on the Draft EIS for Carkeek Park (Volume II) and the Regional Analysis (Volume I) will be held November 1, 1977. Hearings on the Final EIS series are scheduled for March, 1978.

APPENDIX A

ELEMENTS OF THE ENVIRONMENT

WAC 197-10-444 LIST OF ELEMENTS OF THE ENVIRONMENT. (1) Every EIS shall have appended to it a list of the elements of the environment in subsection (2), (3) and (4) of this section. The lead agency shall place "N/A" ("not applicable") next to an item when the proposal, including its indirect impacts, will not significantly affect the area (or subarea) of the environment in question. Items marked "N/A" need not be mentioned in the body of the EIS. Subsections (2) and (3) of this section correspond in subject matter to the questions contained in the environmental checklist used for threshold determination, and the questions in the checklist may be used to interpret this outline listing.

(2) ELEMENTS OF THE PHYSICAL ENVIRONMENT.

(a) Earth.
(i) Geology.
(ii) Soils.
(iii) Topography.
(iv) Unique physical features.
(v) Erosion.
N/A(vi) Accretion/avulsion.

(b) Air.
(i) Air quality.
(ii) Odor.
(iii) Climate.

(c) Water.
(i) Surface water movement.
(ii) Runoff/absorption.
(iii) Floods.
N/A (iv) Surface water quantity.
N/A (v) Surface water quality.
N/A (vi) Ground water movement.
N/A (vii) Ground water quantity.
N/A (viii) Ground water quality.
N/A (ix) Public water supplies.

(d) Flora.
(i) Numbers or diversity of species.
(ii) Unique species.
(iii) Barriers and/or corridors.
(iv) Agricultural crops.

(e) Fauna.
(i) Numbers or diversity of species.
(ii) Unique species.
(iii) Barriers and/or corridors.
(iv) Fish or wildlife habitat.

(f) Noise.

N/A(g) Light and glare.

(h) Land use.

(i) Natural resources.
(i) Rate of use.
(ii) Nonrenewable resources.

(j) Risk of explosion or hazardous emissions.

(3) ELEMENTS OF THE HUMAN ENVIRONMENT.

(a) Population.

N/A(b) Housing.

(c) Transportation/circulation.
N/A(i) Vehicular transportation generated.
N/A(ii) Parking facilities.
N/A(iii) Transportation systems.
N/A(iv) Movement/circulation of people or goods.
N/A(v) Waterborne, rail and air traffic.
(vi) Traffic hazards.

(d) Public services.
N/A(i) Fire.
N/A(ii) Police.
N/A(iii) Schools.
(iv) Parks or other recreational facilities.
N/A(v) Maintenance.
N/A(vi) Other governmental services.

(e) Energy.
(i) Amount required.
(ii) Source/availability.

(f) Utilities.
(i) Energy.
N/A(i[illegible] Communications.
N/A(iii) Water.
(iv) Sewer.
(v) Storm water.
(vi) Solid waste.

(g) Human health (not including mental health)

(h) Aesthetics.

(i) Recreation.

(j) Archeological/historical.

(4) The following additional element shall be covered in all EISs, either by being discussed or marked "N/A," but shall not be considered part of the environment for other purposes:

N/A (a) Additional population characteristics.

(i) Distribution by age, sex and ethnic characteristics of the residents in the geographical area affected by the environmental impacts of the proposal.

WAC 197-10-446 DRAFT EIS--OPTIONAL ADDITIONAL ELEMENTS--LIMITATION. Agencies in their guidelines may add to the list in WAC 197-10-444 additional elements covering social, cultural and/or economic issues. Such additional elements shall become part of the environment for EIS purposes, and not otherwise. The guidelines of the lead agency shall control the content of the EIS, even though other agencies with jurisdiction are involved in the proposal. No agency shall prescribe additional material for an EIS beyond that which is required or optionally allowed by WAC 197-10-440 and -444, or which is added to the elements of the environment by the guidelines of the lead agency pursuant to the authority in this section [see WAC 197-10-440(14)].

APPENDIX B

REFERENCES

See Regional Analysis EIS, Volume I, Appendix A for references.